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NEW ZEALAND JOURNAL OF

Agriculture

DECEMBER - 1951

Cooper News

FARM BULLETIN published by COOPER, McDOUGALL & ROBERTSON (N.Z.) LTD.
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No. 21 PUBLISHED EVERY SECOND MONTH December, 1951

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NEW ZEALAND JOURNAL OF Agriculture

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This Month's Cover

Christmas dinner in the traditional British style was one of the customs maintained in New Zealand by the early settlers, despite the fact that many of the dishes were scarcely appropriate for the season. Though many families, particularly those in country districts, have dinner at home on the grand scale, picnic meals with a modified Christmas flavour have tended to become increasingly popular. This month's cover, a colour reproduction by Perry Photographer from a photograph by Sparrow Industrial Pictures Ltd., shows a family group at an Auckland beach.

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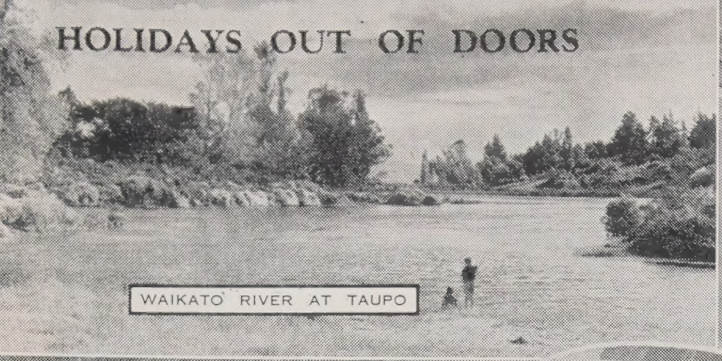
HOLIDAYS OUT OF DOORS



WAIKATO RIVER AT TAUPO

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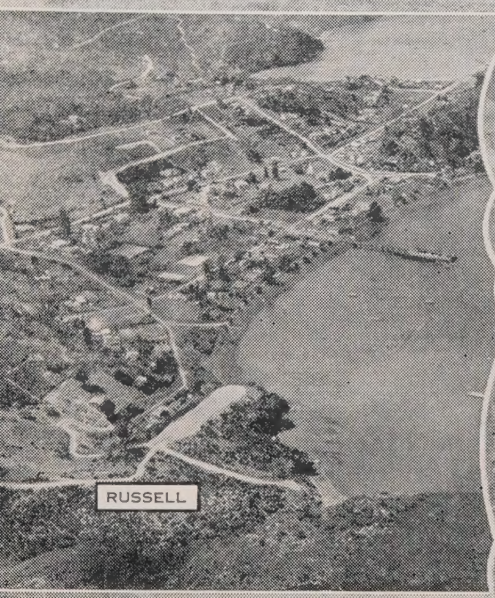

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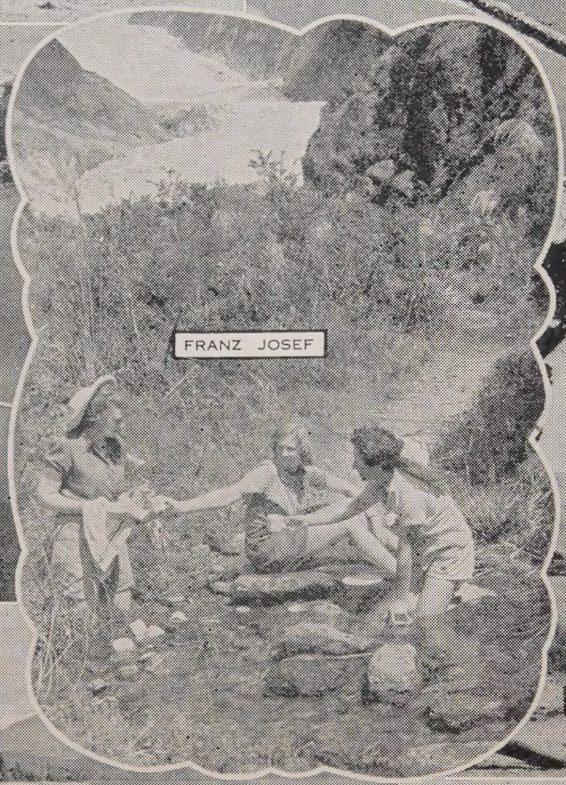

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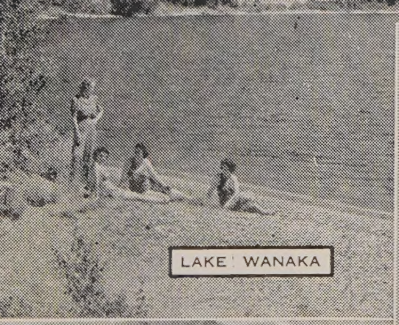
OPONONI HOKIANGA HARBOUR

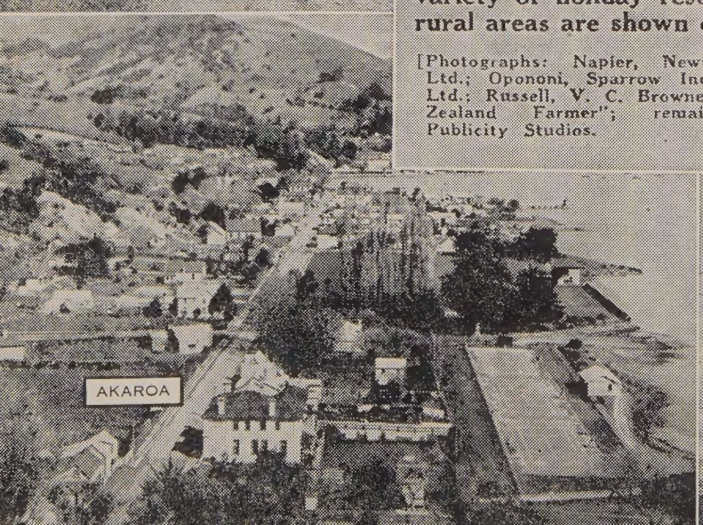


LAKE WANAKA

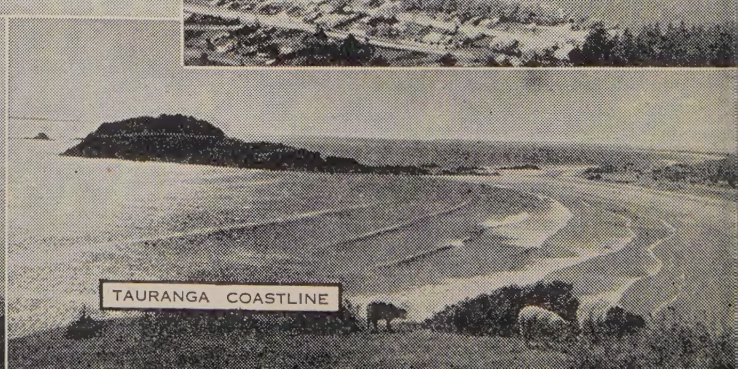
There is a great movement of people to the countryside and seaside at Christmas, a holiday that in New Zealand is traditionally spent out of doors. Peaks of seasonal work in some branches of agriculture prevent country people relaxing as completely as townspeople at this time. Some of the variety of holiday resorts close to rural areas are shown on this page.

[Photographs: Napier, News-Photo Service Ltd.; Opononi, Sparrow Industrial Pictures Ltd.; Russell, V. C. Browne; Akaroa, "New Zealand Farmer"; remainder, National Publicity Studios.

QUEENSTOWN



AKAROA



TAURANGA COASTLINE

Prospects of Pyrite for Superphosphate Manufacture

THE mission composed of Messrs. L. J. Stevens, W. Goodfellow, and R. B. Tennent which went to Australia to investigate the possibilities of our securing regular shipments of pyrite for use in the manufacture of superphosphate has presented its report. Broadly what was learned does not improve the short-term prospects for using this alternative raw material for producing sulphuric acid for superphosphate manufacture, but it has given the Government a better understanding of Australia's problems and what advantage we may later be able to take of pyrite deposits in the Commonwealth.

The delegation confirmed that there are plenty of sulphur-bearing materials in Australia. The most suitable source of supply is at Mt. Morgan mine in Queensland, which has abundant pyritic material and could quickly develop a high-grade supply of concentrates. Mt. Morgan is 90 miles by rail from the port of Gladstone, which is 1510 nautical miles from Auckland, or less than one day's steaming further than Sydney.

Australian Policy

Australia has begun a programme of complete conversion of sulphur and sulphuric acid plants to the use of home sources of pyrite and anhydrite. Conversion is impeded by many problems, and until she can see that her own requirements are likely to be met her Government finds it difficult to agree to the export of sulphur-yielding materials.

The current Australian estimate of reaching the goal set is 5 years. Despite that opinion, the New Zealand delegation formed the impression, confirmed by the British Phosphate Commission, that vigorous development work in Australia could produce sufficient pyrite for Australia and for a satisfactory surplus for export to New Zealand within 2 or 3 years.

Mt. Morgan Prepared to Develop Output

Subject to settlement of certain domestic problems with the Commonwealth Government and subject to that Government's approval, Mt. Morgan Ltd. intimated to the delegation that it was prepared to develop its output of pyrite concentrates to meet a reasonable proportion of the Australian demand and to cover any contractual arrangements between the company and New Zealand.

Farmers will recall that the report of Dr. G. L. Bridger recommended that in the development of our superphosphate-manufacturing industry it would be a wise insurance to build a pyrite-burning plant at Auckland to produce enough sulphuric acid to serve the three Auckland works. The visit of the delegation to Australia was part of the Government's policy to push ahead with plans aimed at providing adequate supplies of superphosphate. Dr. Bridger estimated the cost of the type of pyrite plant which would be required at Auckland at £1,500,000. To justify that expenditure we should ensure a continuity of supply of pyrite, as it would not be advisable to rely on pyrite drawn from various sources as the opportunity offered.

Part Production from Pyrite

Though it is conjectured by some that the world sulphur position will improve, at least temporarily, in about 2 years, the Government feels that a safe policy for New Zealand is to have facilities to produce from pyrite a portion at least of the acid required for the manufacture of superphosphate. There seems to be little doubt that our best source of pyrite would be Australia. The British Phosphate Commission has investigated the possibilities of securing satisfactory supplies from other soft-currency areas, but the prospects are not good.

Normally, sulphur from pyrite is more expensive to produce than sulphur from the Frasch domes in U.S.A., but it has been estimated that Mt. Morgan pyrite concentrate could be landed at Auckland at only a slightly higher cost per unit of sulphur than American brimstone. This is possible only because the Mt. Morgan company extracts gold and copper from the ore, and the pyrite concentrate is a by-product.

The Government is giving the fullest consideration to the delegation's report and all possible steps will be taken to arrange for some of the natural stores of pyritic material with which Australia is so well endowed to be exported to this country, thereby helping in the supply of the fertilisers that mean so much to our primary producers.

The Government is also preparing the strongest possible case for the allocation of more sulphur to New Zealand in 1952 by the International Materials Conference, particularly in view of the difficulty in which we are placed through having no alternative sulphur-bearing resources of our own.

Fertiliser Measures to Continue

Because of the shortage of sulphur, the same measures which applied to phosphatic fertilisers in 1951 will continue in force. No straight superphosphate will be available, but farmers will have the three alternatives, serpentine superphosphate, reverted superphosphate, and "super. compound".

K. J. HOLYOAKE, Minister of Agriculture.

Alternative Fertilisers to Superphosphate

By P. B. LYNCH, Field Crop Experimentalist, Department of Agriculture, Wellington

A CRITICAL shortage of sulphur supplies has focused attention on possible alternatives to superphosphate. Fortunately the Extension Division of the Department of Agriculture for many years has conducted a large number of experiments in all parts of New Zealand with materials that might with advantage replace superphosphate for certain purposes and in certain districts. The results of this work are summarised in this article.

COMPARISONS of the results obtained from fertilisers are made in this article on a regional basis with the county as a unit, but a complete picture can be obtained only with reference to soil types. This picture is being built up slowly and it is hoped to publish in the "Journal" a fuller account of the results obtained from each fertiliser considered. Subsequent articles will deal with results from basic slag and ground North African and Nauru phosphate rocks. The regional survey, however, does give a good general picture of fertiliser responses. To a considerable degree the soil types of New Zealand show a regional distribution. This has resulted not only from the effect of climate as a soil-forming process, but also from the pattern of soils formed from volcanic ash showers, which cover a large proportion of the North Island.

Types of Trial Considered

Four main classes of trials have been summarised:—

1. Mowing trials on pasture,
2. Observational topdressing trials on pasture,
3. Haying trials, and
4. Trials with annual crops.

The mowing trials and the replicated trials on annual crops give the most accurate information, but the extensive survey of soil types and districts throughout the country has been possible only by the use of simple types of observational topdressing trials. With standardised methods of observation reliable results have been obtained from these trials, which results have been similar to those from yield trials, against which they have been checked wherever possible. In many of the trials conducted between 20 and 30 years ago hay weights were used as a measure of fertiliser responses. Although these trials are not entirely satisfactory as a measure of fertiliser responses, they give additional information in a number of areas where few other types of trial have been conducted.

A general survey of the fertiliser responses of New Zealand soils has shown that practically all soil types respond to phosphatic fertilisers. Responses are generally more marked in the North Island than in the South Island, where pasture production is limited to a greater degree by either cold or dry conditions. Responses to phosphate are slight on recent alluvial soils and on some swamp and meadow soils; elsewhere they are pronounced.

Responses of pastures and crops to the various phosphatic fertilisers have been considered both on limed and on unlimed ground, as it has been found that in many cases differences exist in the behaviour of these fertilisers in the presence and in the absence of applied lime.

BASIC SLAG

The better grades of basic slag have from 16 to 18 per cent. total P_2O_5, of which 14 to 16 per cent. is citric soluble. Superphosphate has from 20 to 22 per cent. total P_2O_5, of which about 20 per cent. is water soluble.

Mowing Trials

Comparisons shown in Table 1 are based on applications of superphosphate and basic slag to give equivalent per acre dressings in terms of total P_2O_5. Superphosphate is applied at 3 or 4cwt. per acre each year.

Observational Pasture Trials

Results from 443 trials comparing superphosphate and basic slag, each applied at 3cwt. per acre, may be summarised as follows:—

North Island

In Northland basic slag is generally superior to superphosphate on unlimed ground and frequently also on limed

HEADING PHOTOGRAPH: Raw sulphur at a fertiliser works for manufacture of sulphuric acid for superphosphate manufacture. Sparrow Industrial Pictures Ltd. photo.

ground. Equivalent results to those from superphosphate are found in most other localities except in Tauranga, Poverty Bay, Manawatu, Rangitikei, Hawkes Bay, and parts of the Wairarapa, where basic slag gives inferior results.

South Island

Basic slag gives results as good or better than superphosphate in Westland, Nelson, and coastal districts of Otago and Southland, but it is generally inferior on the drier inland areas of Otago and the east coast generally.

Haying Trials

Fifty haying trials in the Otago-Southland district show that on the average superphosphate has given slightly higher yields of hay than basic slag. However, most of these trials were in the drier, inland districts where observational trials indicate that basic slag is relatively less effective.

Summary of Results

Basic slag gives better results than superphosphate on pastures on the more acid soils in the absence of applied lime. However, superphosphate with lime will usually give better responses than basic slag on such soils, and in most cases at least as good results as basic slag plus lime. In the dairy farming districts of Northland, Waikato, Taranaki, and Westland basic slag gives at least as good results as superphosphate, and on acid soils where liming is impracticable it would be preferable to use basic slag rather than superphosphate to achieve pasture response.

In these districts, therefore, and if considerations of price and availability are disregarded, basic slag could replace superphosphate on pastures without loss of production.

NORTH AFRICAN ROCK PHOSPHATE

Finely ground North African rock phosphate as sold in New Zealand has a total P_2O_5 content of about 26 per cent., of which about 10 per cent. is citric soluble. A typical sample is ground sufficiently fine that 90 per cent. passes the 100-mesh British standard sieve.

Mowing Trials

Table 2 summarises results from pasture trials where superphosphate and North African phosphate have been applied at rates to give equivalent per acre applications of total P_2O_5.

Observational Pasture Trials

The results from 164 trials with applications of superphosphate and North African phosphate at 3cwt. per acre in each case indicate that ground North African rock phosphate gives as good responses as superphosphate on unlimed ground in Waikato, Northland, and Westland. In other districts it is generally inferior. This inferiority is more pronounced on limed ground and especially in the drier east coast districts of the Bay of Plenty, Hawkes Bay, Wairarapa, and Canterbury.

In two haying trials, one at Marton and one in the Wairarapa, North African phosphate yielded considerably less hay than superphosphate, especially on limed ground in the Wairarapa trial.

TABLE 1—COMPARISON OF BASIC SLAG AND SUPERPHOSPHATE ON PASTURE

Location of trial	Period	Dry matter of pasture herbage (lb. per acre)				Significance of differences (based on green weights)	
		Unlimed ground		Limed ground			
		Total yields super.	Yields basic slag relative to super. = 100	Total yields super.	Yields basic slag relative to super. = 100	Unlimed	Limed
Dargaville	1947–50 (3 years)	25,337	100	26,994	98	N.S.*	N.S.*
Rotorua†	1949–50 (6 months)	3,400	108	—	—	N.S.*	—
Hamilton	1947–50 (3 years)	23,340	103	—	—	N.S.*‡	—
Marton (1)	1932–40 (8 years)	74,034	101	79,333	95	N.S.*	Sig. (1%)§

* Difference is not significant on statistical analysis.
† On white clover sward.
‡ Significance based on dry weights.
§ Difference reaches significance level on statistical analysis.

Crop Trials

Wheat

Thirty-six trials have compared superphosphate with North African phosphate on wheat, and in practically every trial superphosphate has given the better yields. The difference in favour of superphosphate ranged as high as 11.6 bushels per acre and averaged 3.4 bushels per acre.

Turnips

A summary of early trials gave the following figures: —

YIELDS IN TONS PER ACRE

Season*	Super-phosphate	North African phosphate	Difference in favour of super-phosphate
1924–25 ..	17.5	15.5	2.0
1925–26 ..	15.5	14.7	0.8
1926–27 ..	20.1	11.9	8.2
1927–28 ..	11.1	6.8	4.3
1928–29 ..	17.5	13.0	4.5

* The numbers of trials in each year are not available.

Superphosphate has given consistently better yields than North African phosphate on turnips.

Summary of Results

Finely ground North African rock phosphate gives its best results as a pasture topdressing in the Waikato and Northland districts of the North Island and on the west coast of the South Island. In these districts, and particularly on unlimed ground, it gives as good results as superphosphate. On limed ground, however, and over most of the rest of New Zealand, responses are generally inferior to those of superphosphate. In trials with wheat and turnips it has given yields consistently lower than those from superphosphate.

It would therefore seem that best use would be made of North African phosphate on pastures in the northern districts of the North Island, more especially on those areas where lime

Mowing and weighing the herbage in one of the mowing trials at the Marton Experimental Area.

applications are impracticable. Under such conditions it is a satisfactory replacement for superphosphate.

SERPENTINE SUPERPHOSPHATE

Serpentine superphosphate is prepared by mixing superphosphate with ground serpentine rock in the proportions of 3 : 1 in such a manner that considerable reversion of the superphosphate occurs. A typical analysis shows 16 per cent. total P_2O_5, of which 13.5 per cent. is citric soluble. A well-reverted line will have a water-soluble P_2O_5 content of 2 to 4 per cent.

Mowing Trials

Of the trials summarised by Table 3 the comparison of serpentine superphosphate with superphosphate has been on the basis of equivalent applications of total P_2O_5 in the Dargaville, Rotorua, and Hamilton experiments. In the Marton trial both phosphates were applied at 4cwt. per acre each year, and in the Winton trial the comparison was 3cwt. of lime-reverted superphosphate with the same quantity of serpentine superphosphate applied each year. The total P_2O_5 content of these two fertilisers was approximately the same.

TABLE 2—COMPARISON OF NORTH AFRICAN PHOSPHATE AND SUPERPHOSPHATE ON PASTURE

Location of trial	Period	Dry matter of pasture herbage (lb. per acre)				Significance of differences (based on green weights)	
		Unlimed ground		Limed ground			
		Total yields super.	Yields N. African relative to super. = 100	Total yields super.	Yields N. African relative to super. = 100	Unlimed	Limed
Dargaville	1947–50 (3 years)	25,337	99	26,994	93	N.S.*	N.S.†
Rotorua‡	1949–50 (6 months)	3,400	73	—	—	N.S.†	—
Hamilton	1947–50 (3 years)	23,340	95	—	—	N.S.§	—
Marton (I)	1932–40 (8 years)	74,034	96	79,333	93	Sig. (5%)‖	Sig. (1%)‖

* Difference is not significant on statistical analysis.
† Difference is just not significant on statistical analysis.
‡ On white clover sward.
§ Significance based on dry weights.
‖ Difference reaches significance level on statistical analysis.

TABLE 3—COMPARISON OF SERPENTINE SUPERPHOSPHATE AND SUPERPHOSPHATE ON PASTURE

Location of trial	Period	Dry matter of pasture herbage (lb. per acre)				Significance of differences (based on green weights)	
		Unlimed ground		Limed ground			
		Total yields super.	Yields serp. super. relative to super. = 100	Total yields super.	Yields serp. super. relative to super. = 100	Unlimed	Limed
Dargaville	1947–50 (3 years)	25,337	98	26,994	99	N.S.*	N.S.*
Rotorua†	1949–50 (6 months)	3,400	104	—	—	N.S.*	—
Hamilton	1947–50 (3 years)	23,340	99	—	—	N.S.*‡	—
Marton (S)	1940–48 (8 years)	71,709	102	—	—	N.S.*	—
Winton§	1947–50 (3 years)	23,492	96	—	—	N.S.*	—

* Difference between fertilisers is not significant on statistical analysis.
† On white clover sward.
‡ Significance based on dry weights.
§ Comparison with lime-reverted superphosphate.

TABLE 4—COMPARISON OF SERPENTINE SUPERPHOSPHATE WITH SUPERPHOSPHATE ON BARLEY AND MAIZE

Crop	Year	County	Yields in bushels per acre			Difference serp. super. from super.	
			Control	Super.	Serp. super.		
Barley	1941–42	Ellesmere	42.8	52.5	50.7	—1.8	N.S.*
Barley	1941–42	Lake	19.5	19.3	20.5	+1.2	N.S.*
Barley	1946–47	Ashburton	38.1	41.1	46.7	+5.6	Sig.*
Barley	1946–47	Ashburton	41.6	48.1	51.0	+2.9	N.S.*
Barley	1947–48	Vincent	53.3	47.7	48.7	+1.0	N.S.*
Barley	1948–49	Amuri	56.3	54.3	59.1	+4.8	Sig.†
Barley	1949–50	Vincent	42.3	37.2	40.0	+2.8	N.S.*
Maize	1946–47	Hobson	33.5	43.9	53.2	+9.3	
Maize	1947–48	Hobson	40.1	48.7	49.5	+0.8	N.S.*
Maize	1947–48	Bay of Islands	34.7	82.0	72.4	—9.6	
Maize	1948–49	Hobson	42.6	53.7	51.1	—2.6	N.S.*

* Difference between fertilisers is not significant on statistical analysis.
† Difference between fertilisers is significant on statistical analysis.

Observational Pasture Trials

Two sets of comparisons are available for observational pasture trials. In the first, 240 trials compare superphosphate with serpentine superphosphate on the basis of an equal weight of fertiliser per acre (3cwt.), and in the second, 112 trials compare 3cwt. of superphosphate with 4cwt. of serpentine superphosphate to give approximately equivalent dressings per acre of total P_2O_5.

In the North Island on an equal weight basis serpentine superphosphate has given at least equivalent results to superphosphate in all districts; it was superior in North Taranaki and in parts of the Bay of Plenty and Northland. On an equal P_2O_5 basis Northland and North Taranaki show better responses from serpentine superphosphate and in other districts serpentine superphosphate gives at least as good responses as superphosphate.

Relatively few trial results are available from the South Island, but it is apparent that, with the possible exception of the dry inland areas of Canterbury and Otago, serpentine superphosphate has given results on pasture very similar to those from superphosphate.

Crop Trials

For crops susceptible to germination injury when water-soluble fertilisers are placed in contact with the seed comparisons are made with lime-reverted superphosphate as well as with superphosphate.

Wheat

Trial results with wheat were summarised in the article "Manuring of Wheat with Phosphates", which appeared on page 573 of the December 1946 issue of the "Journal". Results considered from 20 trials showed that the mean difference of 0.4 bushels an acre in favour of superphosphate (in the comparison with serpentine superphosphate, each having been applied at 1cwt. per acre) was not statistically significant.

Sixteen trials had a dressing of about 90lb. of superphosphate per acre as an additional treatment to the 1cwt. treatment. Results from these 16 trials are shown below. (The 90lb. dressing gives approximately the same P_2O_5 per acre as 1cwt. of serpentine superphosphate.)

	Bushels per acre
1. No fertiliser	36.6
2. Superphosphate 90lb. per acre	37.3
3. Superphosphate 1cwt. per acre	38.0
4. Serpentine superphosphate 1cwt. per acre	37.8

The increases over no fertiliser from both the 1cwt. per acre of superphosphate and of serpentine superphosphate are statistically significant, but there are no other significant differences. The difference between superphosphate at 90lb. and superphosphate at 1cwt. (0.7 bushels) just fails to reach significance at the 5 per cent. level.

These trials show that serpentine superphosphate is at least as efficient as superphosphate as a fertiliser for wheat.

Other Cereals

In trials on barley and maize serpentine superphosphate and superphosphate were applied at the same weight per acre. On barley serpentine superphosphate has compared very favourably with superphosphate, but the evidence from the few maize trial results available is conflicting. A summary of these trials is shown in Table 4.

Brassicas

Serpentine superphosphate and superphosphate were applied at the same rate per acre in trials on brassicas. These trials are summarised in Table 5. Serpentine superphosphate has proved a satisfactory fertiliser for brassica crops. Counts of plants germinating have shown that it does not seriously affect germination when sown in contact with the seed, and in this respect it equals a well-made lime-reverted superphosphate. However, serpentine superphosphate does not show to advantage over reverted superphosphate, which is quite as efficient a fertiliser for brassicas as serpentine superphosphate.

Linen Flax

A trial in Rangiora County in 1941-42 gave identical yields of fibre (4.7cwt. per acre) to superphosphate and to serpentine superphosphate.

Potatoes

Equal weights per acre of serpentine superphosphate and superphosphate were applied in the potato trials summarised in Table 6. It is evident that serpentine superphosphate has given equivalent results to superphosphate as a potato fertiliser.

Summary of Results

As a pasture topdressing serpentine superphosphate is as efficient a fertiliser as superphosphate on a weight for weight basis over the greater part of New Zealand. Possible exceptions are South Island districts with rainfalls of less than 30in. a year. The fertiliser is slower in acting than superphosphate, which has frequently given better results shortly after topdressing. However, in a topdressing programme extending over several years in most parts of New Zealand a considerable saving of phosphate could be achieved without loss of production by the use of serpentine superphosphate in place of superphosphate.

As a fertiliser for crops serpentine superphosphate has given equivalent results to superphosphate on cereals and potatoes, but it has no advantage over lime-reverted superphosphate as a brassica fertiliser.

Typical serpentine rock quarry in North Auckland. The rock is taken to the fertiliser works, crushed, and incorporated with superphosphate to make serpentine superphosphate.

LIME-REVERTED SUPERPHOSPHATE

The better grades of lime-reverted superphosphate ("reverted super.") are produced by the addition of 15 per cent. of burnt or slaked lime to superphosphate and are a properly reverted product. Many lines of reverted superphosphate on the market in former years were, however, inadequately reverted. A typical analysis of a satisfactory line shows 16.5 per cent. total P_2O_5, of which 3 per cent. is water soluble.

TABLE 5—COMPARISON OF SERPENTINE SUPERPHOSPHATE WITH SUPERPHOSPHATE ON BRASSICAS

Crop	Year	County	Yields in tons per acre				Differences serp. super. from	
			Control	Super.	Reverted super.	Serp. super.	Super.	Reverted super.
Rape	1940–41	Dannevirke	—	8.6	—	8.5	—0.1	—
Chou moellier	1940–41	Waipawa	—	29.8	—	31.5	+1.7	—
Chou moellier	1940–41	Waipawa	—	31.0	—	34.6	+3.6	—
Swedes	1940 41	Waitotara	—	—	56.8	55.7	—	—1.1
Swedes	1940 41	Southland	—	—	39.1	38.2	—	—0.9
Swedes	1941–42	Ellesmere	10.8	13.2	—	12.3	—0.9	—
Swedes	1941–42	Pahiatua	7.6	11.0	—	10.5	—0.5	—
Swedes	1941–42	Eketahuna	—	—	24.4	23.9	—	—0.5
Swedes	1940–41	Egmont	—	11.0	—	15.1	+4.1	—
Swedes	1940–41	Waitotara	—	—	45.2	38.8	—	—6.4
Turnips	1940–41	Oxford	13.2	13.1	—	14.4	+1.3	—
Swedes	1940–41	Horowhenua	—	—	32.8	28.8	—	—4.0
Swedes	1940–41	Horowhenua	—	—	21.2	28.8	—	+7.6
Swedes	1940–41	Waitotara	—	—	39.9	39.6	—	—0.3
Swedes	1940–41	Southland	—	—	37.6	35.3	—	—2.3
Swedes	1945–46	Southland	—	—	20.5	18.8	—	—1.7
Swedes	1945–46	Rangitikei	—	15.3	—	15.4	+0.1	—

Mowing Trials

Table 7 summarises the results from 3 trials where equivalent applications per acre of total P_2O_5 were made of superphosphate and reverted superphosphate.

Observational Pasture Trials

The comparison between reverted superphosphate and superphosphate is available from 85 trials. In these trials both fertilisers were applied at the same weight per acre.

Apart from the Bay of Plenty and possibly South Taranaki, where it is inferior, reverted superphosphate has given similar responses to superphosphate. In Northland it has been inferior on limed ground. The number of trials is insufficient, however, to enable sound conclusions to be reached.

In the South Island reverted superphosphate has been inferior to superphosphate in the dry inland districts of Canterbury and Otago, but has given similar responses elsewhere. In the counties of Akaroa, Ashburton, and Southland, where considerable numbers of trials have been conducted, there is little difference between the two fertilisers.

A comparison has been made between reverted superphosphate and serpentine superphosphate. Relatively few trials give this comparison, but in most of these the two fertilisers have given similar results. The exception occurs in trials in the Bay of Plenty, where reverted superphosphate gives results definitely inferior to serpentine superphosphate.

Seven haying trials in the Christchurch area showed practically the same response in hay yields to reverted superphosphate as to serpentine superphosphate.

To summarise, the available trial evidence would indicate that reverted superphosphate gives equivalent results to both superphosphate and serpentine

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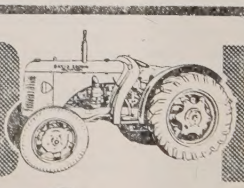

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superphosphate in most districts. The use of this fertiliser for pasture topdressing is largely confined to Otago and Southland at present; it was originally introduced as a crop fertiliser, particularly for brassicas, but it would appear as though its extended use in other districts is warranted. Further experimental work is required to evaluate more precisely the place of reverted superphosphate in pasture topdressing.

Crop Trials

Comparisons with Superphosphate

Table 5 gives results from a number of trials with brassica crops which include the application of both reverted and serpentine superphosphate. In addition to these trials a small number of experiments on potatoes, linen flax, and linseed show reverted superphosphate giving yield responses very similar to those of superphosphate.

A large number of trials conducted with wheat are summarised in Table 8.

Reverted superphosphate over a large number of trials has given lower yield responses of wheat than has superphosphate.

Comparisons with Serpentine Superphosphate

Wheat: Twenty-six trials measuring yield were conducted during the years 1940 to 1944. Reverted superphosphate was almost invariably less effective than serpentine superphosphate, but in individual trials the differences in yield were seldom significant. The average difference in yield over all trials was 0.6 bushels per acre in favour of serpentine superphosphate.

Swedes: The results of 11 trials are available in which yields per acre were measured. Reverted superphosphate yielded on an average 2 tons more per acre than serpentine superphosphate.

Other crops: Other crops were covered only by one or two trials, each measuring yields. The results showed no significant difference between treatments.

As a crop fertiliser reverted superphosphate has given good results with brassicas, but is generally inferior both to superphosphate and to serpentine superphosphate with cereals.

Summary of Results

The use of reverted superphosphate as a pasture topdressing could, with no adverse effect on production, be extended from districts such as Southland, where it is in general use, to most parts of New Zealand.

It is a relatively unsatisfactory fertiliser when sown with cereals, but is particularly valuable for brassica crops.

GROUND NAURU ROCK PHOSPHATE

Nauru phosphate has been used in trials for the past 30 years. The evidence from early trials showed general inferiority to superphosphate and little attention was paid to the fertilising possibilities of this material until 1939, when the prospect of superphosphate shortages became apparent. No fineness analyses are available for the early haying trials, but 95 per cent. of the Nauru phosphate rock used during the trials since 1939 has passed through a 100-mesh British standard sieve. The total P_2O_5 content of this material is about 36 per cent., of which up to 8 per cent. is citric soluble. Of the very finely ground material now being used in trials 83 per cent. passed the 200-mesh British standard sieve.

TABLE 6—COMPARISON OF SERPENTINE SUPERPHOSPHATE WITH SUPERPHOSPHATE ON POTATOES

Year	County	Yields in tons per acre				Differences serp. super. from	
		Control	Super.	Reverted super.	Serp. super.	Super.	Reverted super.
1939–40	Franklin	—	6.5	—	6.5	nil	—
1939–40	Franklin	—	6.4	—	6.1	—0.3	—
1940–41	Kairanga	11.7	15.4	—	14.9	—0.5	—
1940–41	Franklin	6.8	6.8	—	7.0	+0.2	—
1940–41	Taranaki	—	6.0	—	7.2	+1.2	—
1940–41	Waimarino	6.0	7.0	—	7.4	+0.4	—
1940–41	Rangitikei	8.4	8.8	—	8.7	—0.1	—
1940–41	Rangiora	—	9.5	—	10.3	+0.8	—
1940–41	Ashburton	10.8	11.8	—	12.2	+0.4	—
1940–41	Eyre	13.0	13.3	—	13.9	+0.6	—
1940–41	Waimairi	5.8	6.3	—	6.7	+0.4	—
1940–41	Waimate	1.3	1.5	—	1.4	—0.1	—
1940–41	Rangitikei	—	21.4	18.3	21.2	—0.2	+2.9
1948–49	Waikouaiti	3.2	5.1	—	4.4	—0.7	—

TABLE 7—COMPARISON OF REVERTED SUPERPHOSPHATE WITH SUPERPHOSPHATE ON PASTURE

Location of trial	Period	Dry matter of pasture herbage (lb. per acre)				Significance of differences (based on green weights)	
		Unlimed ground		Limed ground			
		Total yields super.	Yields reverted super. relative to super. = 100	Total yields super.	Yields reverted super. relative to super. = 100	Unlimed	Limed
Dargaville	1947–50 (3 years)	25,337	100	26,994	95	N.S.*	N.S.*
Rotorua†	1949–50 (6 months)	3,400	89	—	—	N.S.*	—
Marton (B6)	1949–51 (2 years)	11,053	101	11,212	102	N.S.*	N.S.*

* Difference betwen fertilisers is not significant on statistical analysis.
† On white clover sward.

TABLE 8—COMPARISON OF REVERTED SUPERPHOSPHATE WITH SUPERPHOSPHATE ON WHEAT

Season	Number of trials	Mean yields in bushels per acre			Mean difference super. minus reverted super.
		Control	Super.	Reverted super.	
1923–24 to 1928–29	29	—	—	—	+1.2
1927–28	6	57.2	61.2	60.4	+0.8
1928–29	12	42.1	48.2	46.2	+2.0
1940–41	7	35.4	37.7	37.0	+0.7
1941–42	6	44.2	45.1	44.5	+0.6
1942–43	10	35.0	36.3	35.1	+1.2
1943–44	4	38.3	38.7	37.9	+0.8
1944–45	1	59.6	62.2	60.0	+2.2

Mowing Trials

The results of mowing trials of Nauru phosphate are summarised in Table 9.

At the Hamilton trial fertilisers were applied at the total P_2O_5 equivalent of 3cwt. per acre a year of superphosphate; at Marton both fertilisers were applied at 4cwt. per acre each year.

Observational Pasture Trials

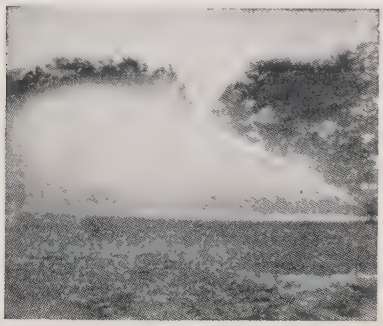
Ninety-three trials with finely ground Nauru phosphate have been conducted since 1939. In these trials both Nauru phosphate and superphosphate were applied at 3cwt. per acre.

In the North Island Nauru phosphate showed general inferiority in pasture responses to superphosphate. It was markedly inferior on the east coast and the Bay of Plenty, but in parts of Northland it was inferior only on limed ground.

In the west coast and Sounds district of high rainfall in the South Island Nauru phosphate has at times given similar results to superphosphate, but on the drier east coast it has been uniformly inferior.

As a pasture topdressing and applied at the same rates as superphosphate, ground Nauru rock phosphate has given disappointing results.

An endeavour was made to examine the cumulative effect of annual topdressings on these trials, but only in a few trials did Nauru phosphate gain relatively on superphosphate during the progress of the experiment. In 11 trials observations were continued for some years after topdressing ceased to study the residual effects of these



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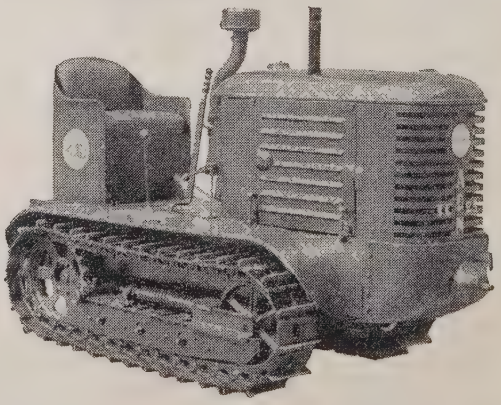

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Responses in an observational topdressing trial in the Whangarei district. Left—No manure. Right—Lime and superphosphate.

fertilisers. Nauru phosphate showed no general superiority over superphosphate for residual effects on these trials, but in 3 trials (Marton, Wairoa, and Waihi) the pasture response on the Nauru phosphate plots was maintained considerably longer than on the superphosphate plots.

In 5 haying trials Nauru phosphate was in most cases markedly inferior in yields of hay to superphosphate. In 2 trials where the comparison was also made on limed ground the inferiority was even more pronounced. In most trials, however, the position of the Nauru phosphate treatment relative to superphosphate improved as the years passed.

Crop Trials

The only results of crop trials available are from 6 wheat trials conducted in the 1927-28 season. The mean yields of these trials were as follows:—

	Bushels per acre
No manure	57.2
Superphosphate	61.2
Nauru phosphate	58.6

Nauru phosphate has given considerably lower yields than superphosphate on wheat.

Summary of Results

As a pasture topdressing and applied at the same weight per acre as that normally used for superphosphate, ground Nauru rock phosphate gives responses generally much inferior to superphosphate. In some cases it shows a more lasting effect than superphosphate.

More work is required using heavier dressings of Nauru phosphate. Trials are planned in which it is incorporated in the soil, where its rate of solubility will probably be greater than if left on the surface as a topdressing. Very finely ground material is also being tried. It is unlikely that Nauru phosphate will be useful for direct application to the soil other than as a fertiliser for pastures. For that purpose it will be most useful in the high-rainfall districts, more especially on acid, leached soils where adequate liming is impracticable.

TABLE 9—COMPARISON OF NAURU PHOSPHATE WITH SUPERPHOSPHATE ON PASTURE

Location of trial	Period	Dry matter of pasture herbage (lb. per acre)		Significance of difference
		Total yields super.	Yields Nauru relative to super. = 100	
Hamilton	1947–50 (3 years)	23,340	92*	Sig. (1%) (on dry weights)†
Marton	1939–45 (6 years)	55,918	97	Sig. (1%) (on green weights)†

* Makatea phosphate, a rock very similar to Nauru phosphate, used.
† Difference between fertilisers is significant on statistical analysis.

FUSED AND CONCENTRATED FERTILISERS

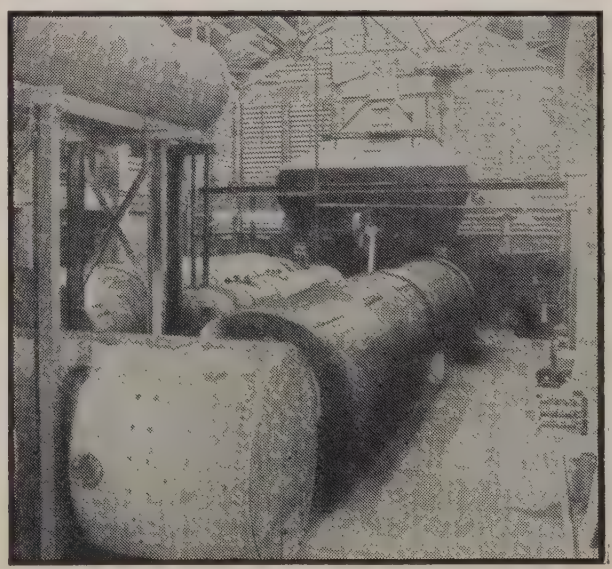
Over the past 4 years a number of pasture trials have been conducted with various types of fused and concentrated fertilisers. The percentages of total P_2O_5 in these materials are as follows:—

"Thermophos" (a calcium magnesium phosphate from U.S.A.)	20
"Fused Tricalcium Phosphate"	27
"Metaphos" (calcium metaphosphate from U.S.A.)	63
Silico-phosphate (from England)	33
Double superphosphate (electric-furnace process, from U.S.A.)	49
"Fertiphos" (a concentrated dicalcic phosphate)	39

Mowing Trials

Results so far available of mowing trials with fused and concentrated fertilisers are summarised in Table 10. In these trials comparisons are made on the basis of equivalent applications per acre of total P_2O_5 and on unlimed ground. In the section "Dry matter of pasture herbage" in the table the figures in parentheses are comparative yields to superphosphate when the yield of superphosphate is expressed as 100.

All these phosphates have yielded very similarly to superphosphate, "Thermophos" at Hamilton being the only one to outyield superphosphate significantly over a 3-year period. On the Marton E trial "Metaphos" and



The interior of a burner house, showing the portion of the rotary burner in which the sulphur is burnt for the production of sulphuric acid.

TABLE 10—COMPARISON OF FUSED AND CONCENTRATED FERTILISERS WITH SUPERPHOSPHATE ON PASTURE

Location of trial	Period	Dry matter of pasture herbage (lb. per acre)							
		Control	Super.	"Fused Tri. Phos."	"Meta-phos"	"Thermo-phos"	Double super.	Silico-phos.	"Ferti-phos"
Rotorua*	1949–50 (6 months)	—	3,400	3,531 (103)	—	—	—	—	—
Hamilton	1947–50 (3 years)	20,980 (90)	23,340	22,977 (98)	22,854 (98)	24,488 (105)†	23,064 (99)	—	—
Marton (E)‡	1947–49 (2 years)	—	75,127	71,150 (95)†	69,842§ (93)	—	72,463 (96)	71,750 (96)	—
Marton (N)	1950–51 (7 months)	—	4,270	—	—	4,210 (99)	—	—	4,126 (97)

* On white clover sward.
† Significant differences from superphosphate.
‡ Figures given are green weights.
§ Just not significantly inferior to superphosphate.

"Fused Tricalcium Phosphate" yielded significantly less than superphosphate in the first year. Evidence from the other trials also indicates that superphosphate is more quickly acting than the fused phosphates.

Observational Pasture Trials

Of a considerable number of observational pasture trials now open 13 have been in progress sufficiently long for the results to be worth considering. In most cases the new fertilisers have given results similar to those from superphosphate. The fused phosphates have done particularly well in comparison with superphosphate in the Whangamomona district, "Metaphos" probably being slightly better than "Fused Tricalcium Phosphate". None of these early trials included "Thermophos", the material which has given promising results in the mowing trial at Hamilton.

These results are sufficiently encouraging to warrant further extensive experimental work. Present indications suggest that some of the materials may prove satisfactory alternatives to superphosphate.

SUMMARY OF ALL TRIALS

If the economic aspect is disregarded, superphosphate could without adverse effect on pasture production, be replaced in most districts of New Zealand by serpentine superphosphate and in the districts with adequate rainfall and acid soils by basic slag or lime-reverted superphosphate. Over most of the Waikato and Northland and the west coast of the South Island ground North African rock phosphate could be used on those soils where liming is impracticable. The newer types of fused and concentrated fertilisers on limited evidence would appear to be satisfactory replacements for superphosphate at least in those districts where basic slag shows to advantage.

Ground Nauru rock phosphate has given disappointing results, but work is required to determine whether its efficiency will be increased by the use of very finely ground material, by the use of heavy applications, and by better means of incorporating it with the soil. A 3 : 1 mixture of superphosphate and Nauru phosphate did not give encouraging results in a preliminary series of trials, but more work is required with various mixtures of superphosphate and Nauru phosphate and with superphosphate and lime. This work is now in progress.

On crops superphosphate could be replaced by serpentine superphosphate on cereals, and lime-reverted superphosphate could be more generally used on brassica crops.

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Trainees will be assisting scientists studying animal problems (Wallaceville and Ruakura) or those engaged on soil, crop, and pasture researches (Rukuhia and Invermay). Salaries offered are good—a boy or girl with school certificate starts at £240 a year—and an employee can reach the position of first-grade technician at £710 a year. There are prospects of promotion to technical officer at £770. There are annual increments to the commencing salary to £578 for men and £508 for women.

Outstanding trainees are given bursaries to study for a science degree, which opens the way to promotion to senior positions in the Department.

Prospective trainees should write to the Personnel Officer, Department of Agriculture, P.O. Box 2298, Wellington, for further information.

BOOK REVIEW

"Pig Production": C. P. McMeekan

PRODUCED as a practical handbook of convenient size (160 pages) C. P. McMeekan's book "Pig Production" will be welcomed by the New Zealand pig producer, for whom it is especially written.

Besides chapters on the pig industry in New Zealand dealing with various facets, from specialised types of pig production to returns from pigs under different systems of management on New Zealand farms, there are chapters dealing specifically with breeding, housing, feeding, the sow and litter, fattening pigs, and management in relation to disease prevention. There is also a guide to general management policy on the typical dairy farm feed supply which merits the careful attention of all pig producers.

A chapter on the New Zealand porker and baconer judging standards has been included, but it is a pity that the 1950 revisions were not incorporated in the judging tables.

Whitcombe and Tombs. 10s. 6d.

—*A.L.*

Marginal Lands Survey

Results of a survey of farms in Akitio County by the Department of Agriculture, the purpose of which was to assemble as much knowledge as possible of the marginal lands problem in one test area, are published in Bulletin No. 339, "Developing Marginal Lands". The bulletin, which is well illustrated with photographs, maps, and graphs, is available from offices of the Department of Agriculture at Auckland, Palmerston North, Wellington, Christchurch, and Dunedin at 10s. a copy.

Control of Blowfly Strike in Sheep

By A. G. BRASH, Veterinarian, Department of Agriculture, Christchurch

THE SHEEP BLOWFLY is responsible for considerable loss to the sheep and wool industry in most seasons and in nearly all sheep-raising areas in New Zealand. The loss includes not only damage to wool and deaths following severe strike, but the time taken for the supervision and treatment of affected flocks. In the past emphasis has been placed on the treatment of struck sheep and many fairly effective applications have been used for this purpose. However, use of modern insecticides has now made possible a reduction in the incidence, particularly of body strike. It is on this preventive aspect of the problem that farmers must now concentrate.

BODY strike and crutch strike, including tail strike, are the most important types of blowfly strike. Of secondary importance are poll strike in rams, pizzle strike in rams and wethers, and a proportion of infestations of marking and other wounds.

Body strike usually starts on withers, shoulders, back, or hips. Young sheep are more often affected. Strikes on the crutch, tail, or pizzle sometimes spread to the body, and this condition must not be confused with true body strike. Crutch strike is usually associated with urine soiling and occasionally soiling with faeces and is therefore more common in ewes.

Types of Flies Causing Strike

In New Zealand only two species of flies are of primary importance in causing strike. They are the common brown blowfly (*Calliphora laemica*) and the greenbottle (*Luicilia sericata*). The brown blowfly is dominant in most of the North Island and the greenbottle in the South Island. The bluebottles are of minor importance in strike in sheep, although they commonly infest meat and carrion.

During its lifetime, which may be as long as 1 month, the adult female fly lays about 1000 eggs in batches of 50 to 100. The eggs hatch out in 1 or 2 days and the young larvae or maggots begin to feed actively. After two moults they reach their maximum size in from 3 to 6 days under favourable conditions. The breathing pores at the posterior end enable them to breathe while their heads are deeply buried when feeding. The adult maggots crawl away from the affected area and fall to the ground, where they seek a sheltered place or burrow into the soil, where they become pupae. The pupae may remain dormant over winter or the adults may emerge in 1 to 2 weeks during summer. The adult females require a protein meal before they begin laying eggs, usually 3 days after emergence. The life cycle takes about 1 month in summer. The fly can travel a considerable distance—10 miles or more.

Causes of Strike

Sheep are not struck by chance. The presence of moisture together with some condition which makes the sheep attractive to the fly is essential. Fleece rot and mycotic dermatitis are the conditions most commonly responsible for the attractiveness to the fly which leads to body strike.

Fleece rot is caused by the multiplication of bacteria on the skin and in the wool when the fleece is kept wet for a prolonged period. Usually there is a weakening of the wool fibres and a greyish or light brown discoloration of the wool. Sometimes, however, the fleece exhibits a very definite colour such as green, purple, blue, red, or a distinct brown, this being due to the pigment produced by the bacteria. The moisture leads to some degree of inflammation of the surface layers of the skin and an exudate which causes the formation of a crust and matting of the fibres. The matting is not as severe as in mycotic dermatitis. Young sheep, because of the openness of the fleece, are more susceptible. Other factors, such as lack of quality or density of the fleece or bad conformation of the withers, may predispose individual sheep to the condition. No effective means of preventing fleece rot is yet available.

Mycotic dermatitis is an infectious disease of the skin which is caused by a mould or fungus (*Actinomyces dermatonomus*) which invades the wool follicles. The exudate caused by the inflammation mats the wool fibres into a hard mass. Mycotic dermatitis is more common in young sheep, although sheep of all ages may be affected. To avoid spreading the disease affected sheep should where possible be shorn last. Where there is any doubt about the nature of the condition a microscopic examination can be made of the infected scabs. The most effective means of control is by dipping the sheep in a weak bluestone solution—1 : 500 (1lb. of bluestone to 50 gallons of water). Such dipping if repeated several times has the disadvantage of detrimentally affecting the dyeing properties of the wool.

Prevention of Strike

Shearing and Crutching

Shearing makes sheep insusceptible to fly strike, although normal shearing is often not done sufficiently close to the worst fly period to be of value.

Crutching is the best method of controlling crutch strike and will usually give protection for about 6 weeks. In some years a second crutching may be necessary, or where this is not possible jetting, as recommended later, may be carried out, together with spraying to prevent body strike.

Tail Length

Australian workers have shown that the length at which the tail is docked is very important in the prevention of crutch strike. To obtain the maximum protection against crutch strike in ewes the tail should be cut at about the level of the tip of the vulva. Very short tails definitely predispose sheep to crutch strike.

Dipping

No dip on the market when used at the ordinary dipping strength will give prolonged protection against fly attack over a significant period. More highly concentrated "Gammexane" and also D.D.T. would give protection, but the cost is usually considered too high for their use as dips. Arsenical dips will give some protection for a limited period, though arsenic at dip strength has no effect on the fully grown maggot. It acts as a stomach poison and kills the younger maggots during the feeding stages.

Spraying and Jetting

The discovery of the newer insecticides D.D.T. and B.H.C. ("Gammexane"), which are persistent and non-toxic to stock, has made it possible to evolve practical methods for the prevention of fly strike. In considering the value of preventive sprays farmers should take into account the time and labour saved in the supervision and treatment of affected flocks. Both D.D.T. and "Gammexane" used either together or separately will greatly reduce the incidence of strike, particularly body strike. These two substances produce their effect in slightly different ways.

To control body strike sheep should be surface sprayed from poll to rump with D.D.T. or B.H.C. An engine-driven, low-volume sprayer should be used.

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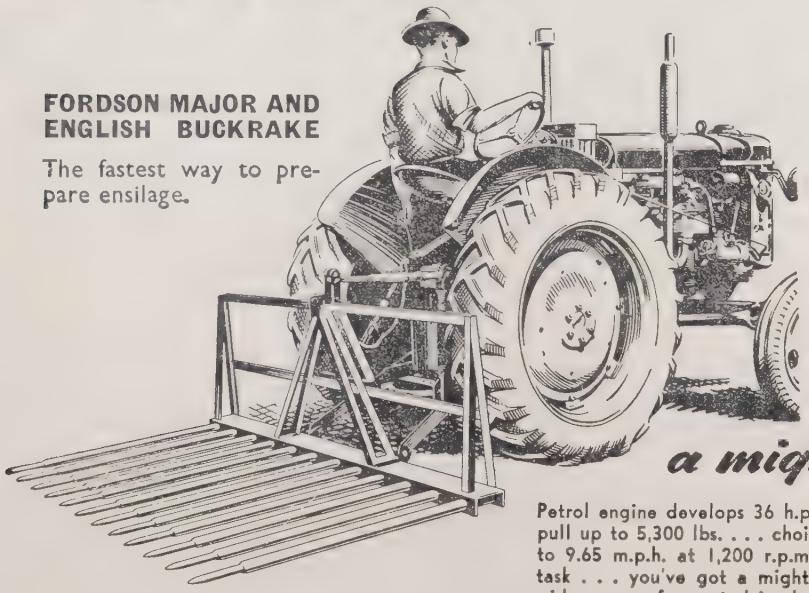

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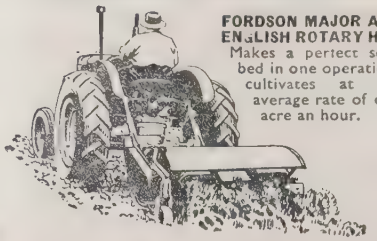

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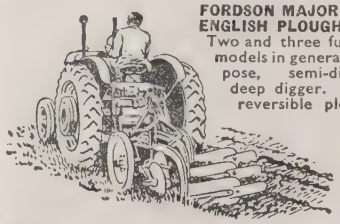

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D.D.T. does not act by killing the maggots, but mainly by preventing the female fly from laying eggs on the treated fleece. The fly spends some time in choosing a suitable place and in creeping in and out of the fleece. During that time the D.D.T. has time to act. D.D.T., because of its extremely low volatility, persists on the sheep for long periods. In this respect it has a slight advantage over the more volatile "Gammexane". D.D.T. will remain effective after a considerable amount of rain. In one Australian field trial when 4in. of rain fell in the 4 days immediately following treatment the D.D.T. gave protection for at least a fortnight while the flies were active. The fly wave then abated and it was not possible to tell how long the protection might have lasted. The time D.D.T. will last will vary according to the conditions, but complete protection has been obtained when the period of fly activity occurred from 4 to 6 weeks after treatment. The strength of D.D.T. recommended by the Australian Joint Blowfly Control Committee is 1.0 per cent, which is not necessarily the minimum strength at which D.D.T. will be effective under New Zealand conditions. Any wettable and dispersable D.D.T. preparation may be used.

"Gammexane" is superior to D.D.T. as a maggot killer. In the recommended strength it kills all stages of the maggots with which it comes in contact. It gives no useful protection at ordinary dipping strength. At about eight times dipping strength, however, it gives protection for a period similar to D.D.T. Under wet conditions it would not be quite as persistent as D.D.T. The strength recommended for use as a preventive spray is 0.05 per cent. gamma B.H.C. Veterinarians can advise on how to obtain this strength. A "straight" "Gammexane" dip of the type prepared for use in shower dips should be used. This does not contain bluestone or substances such as Phenol or cresylic acid, which at increased concentration would damage the wool or harm the sheep.

Mixtures of D.D.T. and "Gammexane" which combine the advantages of both drugs may also be used.

The method of application of sprays is important, as unless sufficient material is applied over the whole area at the correct strength and at sufficient pressure, satisfactory results may not be obtained. To prevent body strike spray should be applied from the poll to the rump. The area to be covered must include the sides of the neck, the shoulders, the withers, and to about half-way down the sides of the body. The main objective is to secure a good, even cover and saturation of the fleece tips to a depth of at least ½in. with a minimum of run-off. A good pressure is essential to give this result. It is not necessary to wet to the skin.

This method of surface spraying will not give protection against crutch or tail strike. When jetting sheep to protect them against crutch strike it is essential to saturate the crutch and the region round the tail thoroughly. The material must penetrate to the skin. Again a good pressure is needed. Spraying and jetting can be done most conveniently in the forcing pen.

The quantity of fluid used per sheep will depend mainly on the size of the sheep and the length of the fleece, particularly in the crutch, but it should range from 1/5 gallon to ½ gallon. Quantities much below 1/5 gallon should not be used and in most cases more than ¼ gallon will not be needed. The cost will usually be between 2d. and 3d. per sheep. One application may be sufficient, but if the fly is active over a longer period, spraying and jetting may be repeated. Better control of crutch strike will be obtained and less material will be used to saturate the crutch if spraying is done in conjunction with crutching.

To control crutch strike sheep should be jetted with D.D.T. or B.H.C. The crutch must be saturated to the skin.

Spraying Equipment

Essential requirements of the spraying or jetting equipment are that it should cover the required area quickly with the minimum waste of material and at a pressure sufficient to penetrate, particularly in the crutch. Although a hand-operated spray pump may be used for the treatment of small numbers of sheep, especially to prevent body strike, a power-driven, low-volume sprayer is essential for the satisfactory spraying and jetting of large numbers. Low-volume weed sprayers may be adapted for the purpose and the cost of such equipment is not high.

The standard low-volume sprayer consists essentially of a tank such as a 44-gallon drum, a filter, a gear pump, a relief valve, a pressure gauge, a control valve, and a boom with spraying nozzle. The return of the excess liquid to the drum through the relief valve will provide sufficient agitation. The nozzle should be of sufficient capacity to deliver the required volume of spray in the time taken to treat one sheep. Full details of the construction of low-volume sprayers were given in articles by C. J. Crosbie in the September and October 1951 issues of the "Journal".

Sheep can also be treated in a shower dip, using the top nozzles only. Finer nozzles giving a mist spray must be fitted to avoid waste of material. As the run-off must not be used again, the fluid is pumped from a drum and the run-off allowed to flow into the sump. If it is desired also to jet the crutch, a length of hose with a hand boom may be fitted to the shower dip unit and the sheep jetted in the draining pen by fitting a temporary race.

Treatment of Struck Sheep

A suitable dressing should kill all maggots without damaging the wool or delaying healing, and should give some protection against restrike. "Gammexane" has been found very effective for this purpose. It kills all maggots with which it comes in contact and also helps to expel them from the wound. The dressing should be applied first, so that any maggots which escape from the struck area will be killed. The wool is then shorn from the struck area, care being taken to include all tracks or extensions to the main strike. A further application of dressing is then made with a small horsehair brush or a swab, the wool surrounding the strike also being treated. The strength of "Gammexane" used for treatment is 0.1 per cent. gamma B.H.C. D.D.T. can also be added with advantage to blowfly dressings to prevent restrike.

Measures to Reduce Fly Population

Trapping of blowflies has little effect on the incidence of fly strike, unless the concentration of traps is so great that the procedure becomes uneconomical. Fly traps may be used to advantage close to dwellings, sheds, and slaughter-houses to reduce the fly population in the immediate vicinity. A large percentage of the flies caught in fly traps are not sheep blowflies.

Important measures to reduce the sheep blowfly population include the application of maggot-killing dressings to struck sheep and the suitable disposal of crutchings. With the use of D.D.T. spray the sheep itself will to some extent act as a fly trap and dead flies will often be found in the wool of treated sheep. Crutchings should be burned or sprayed with 1 per cent. arsenic solution.

In the disposal of carcasses burying alone is not effective, as the flies can emerge through several feet of loose soil. Carcasses should be burned or treated before burying with arsenical dip or a mixture of equal parts of borax and sand applied with a shaker.

Standards of Quality to be Required in Lime to Qualify for Transport Subsidy

FROM the beginning of January the output of each New Zealand limeworks will be required to reach a certain standard of quality before it qualifies for the full transport subsidy. The standards laid down cover both fineness of grinding and calcium carbonate content. The subsidy funds are provided mainly by the Producer Boards, and they are represented on the Lime Advisory Committee, which has authorised the new scheme.

THE standard of fineness will be the same throughout the Dominion. It provides, first, that all the lime (with a tolerance of 5 per cent.) must pass the 8-mesh British standard sieve, that is, a sieve having 8 holes to the linear inch; and, second, that 50 per cent. (with no tolerance) must pass the 30-mesh British standard sieve. This standard has been maintained by most works in the past and is not unduly severe.

The calcium carbonate standard will vary from district to district according to the lime available. The lowest district standard will be 65 per cent. and the highest 85 per cent. A lime which fails to reach the district standard but contains at least 50 per cent. of carbonate will receive the full road transport subsidy, but it will be subsidised on rail for only 50 miles instead of the usual 100 miles—from the 15-mile rail point to the 65-mile rail point. A lime containing less than 50 per cent. of carbonate will receive no rail subsidy, but the road subsidy will be paid for a distance not exceeding 30 miles to be determined by the Director-General of Agriculture.

The purposes of the new scheme are, first, to assist farmers to obtain as high a quality of lime as is reasonably available in each area; second, to ensure that the subsidy funds are applied mainly toward assisting the transport of the better-quality limes; and, third, to enable the continuance in operation of works which produce lime of indifferent quality but which give valuable services in their localities.

Each district standard has been set at a level which would enable about three-quarters of the lime produced recently to qualify, but most producers of sub-standard lime could make a better product by more careful selection of limestone for crushing.

BOOK REVIEW

"Farm Machinery and Tractors": R. H. Cochrane

IN spite of the growth of farm mechanisation the New Zealand farmer still depends on overseas publications for text-book information on the use and care of his machinery. Therefore it is to be regretted that Mr. R. H. Cochrane, as lecturer in agricultural engineering at Canterbury Agricultural College, did not provide his readers with more information covering the application of machinery to New Zealand farming conditions, especially on implements used in pasture seed-bed preparation.

Mr. Cochrane has described the whole range of agricultural machinery and the book is admirably arranged for quick reference and provided with exceptionally clear diagrams. As a means of teaching safe practices, the chapter on "Overturning of Tractors" justifies the publication of the book.

—*H.W.T.E.*

Whitcombe and Tombs Ltd. 12s. 6d.

Publications Received

"Notes for Introductory Courses in Genetics", by Charlotte Auerbach; Oliver and Boyd, 2s. net.

"Scientific Horticulture", vol. x (1950-51), journal of the Horticultural Education Association, Britain; 10s. 6d., post free, from Gibbs and Sons, Orange Street, Canterbury, England.

New Scale of Fees for

SEED CERTIFICATION AND TESTING

FEES charged by the Department of Agriculture for seed certification and seed testing services provided by the Extension Division have been reviewed recently in the light of increased operation costs and the policy of the Government to make such services more nearly self supporting. The Minister of Agriculture, Mr. K. J. Holyoake, has approved the adoption of the following charges for services completed on and after 1 January 1952:—

SEED CERTIFICATION

VARIETY OF SEED	CERTIFICATION FEES (payable on seed when it is finally sealed and tagged)	BLENDING FEES (payable on lines blended after having been finally sealed and tagged)
A—FOR SEEDS CERTIFIED ON FIELD INSPECTION		
Perennial ryegrass, Short-rotation ryegrass, Italian ryegrass	4d. per bushel (20lb.) or part	2d. per bushel (20lb.) or part
Cocksfoot, Timothy, *Phalaris tuberosa*	3d. per 10lb. or part	1½d. per 10lb. or part
Browntop, White clover, Red clover (Montgomery), Cowgrass, Subterranean clover, Lucerne	4d. per 10lb. or part	2d. per 10lb. or part
Wheat, Oats, Barley, Lupins, Ryecorn	1d. per bushel or part	½d. per bushel or part
Onion seed	2d. per lb.	1d. per lb.
Rape, Kale, Chou moellier, Turnip, Swede, Mangel	1 to 14lb. containers: 1d. each 15 to 28lb. containers: 2d. each Containers exceeding 28lb.: 3d. each	½d. each 1d. each 1½d. each
Linen flax	6d. per cwt.	3d. per cwt.
B—FOR SEEDS CERTIFIED ON LABORATORY TEST ALONE		
Perennial ryegrass	3d. per bushel (20lb.) or part	2d. per bushel (20lb.) or part
White clover	3d. per 10lb. or part	2d. per 10lb. or part

C—SEED POTATOES

All varieties: 10s. per acre or part.

Fees are payable before field inspection is undertaken.

If the total area is rejected on field inspection, all fees in excess of 10s. will be refunded.

If portion of the area is rejected on field inspection, all fees paid on rejected portion will be refunded.

D—LATE-ENTRY FEES

A late-entry fee of 10s., covering all entries of any one crop, is payable by the grower in respect of any application for certification received and accepted by the Department after the closing date fixed for that crop.

SEED TESTING

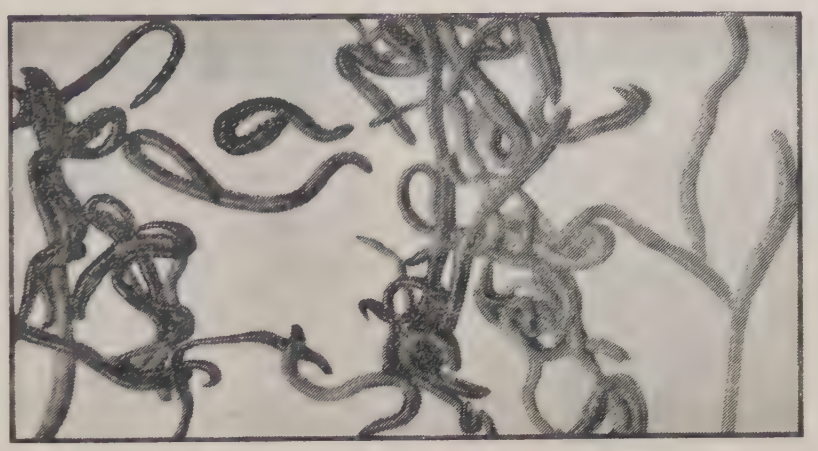
TYPE OF CERTIFICATE ISSUED	CHARGE
Purity only	5s.
Germination only	5s.
Purity and germination combined	10s.
Canadian grading (additional to purity and germination)	5s.
Additional copies of all certificates (each)	6d.

No fee is charged for the testing of samples for private individuals if the result is used only in an advisory manner and is not reported in certificate form.

Fees will no longer be charged for ultra-violet light tests on samples of perennial ryegrass seed or for picric acid tests on samples of white clover seed submitted for certification. These tests in future will be considered as part of the seed-certification service covered by the appropriate certification fee.

Effect of Soil Minerals on Earthworms

SEVERAL New Zealand farmers in recent years have reported that improvement to permanent pastures has followed the appearance of earthworms in the soil. The changes noted have generally taken the form of improved soil texture, encouragement of high-fertility grasses such as ryegrass and clovers, and increased pasture production. One farm in particular, that of Mr. A. S. Ashmore near Raetihi, was investigated on several occasions by different observers and the farmer's claims were substantially confirmed. One such survey made by the Department of Agriculture was reported in "The Journal of Agriculture" for July 1945. The following article by R. L. Nielson, Soil Biologist, Rukuhia Soil Research Station, Department of Agriculture, Hamilton, studies the effect on earthworm populations of the soil content of minerals, and particularly of calcium.



CHANGES in the grass sward on the Raetihi property were found to be associated with the spread of a small earthworm which in 1945 was identified by one authority as *Allolobophora jassyensis*, a species said to occur in south-east Europe. As this species was considered to have unusual value in its capacity to increase the fertility of the soil, the Department of Agriculture took immediate steps to lay down a considerable number of trials in poor-class hill country in both islands. Earthworms from Mr. Ashmore's farm were used throughout the trials, being placed in the soil in selected localities. Soon after this work had been carried out the earthworm was re-examined and found to be not *Allolobophora jassyensis* but the allied *A. caliginosa*, which had been noted in various parts of New Zealand since as early as 1876.

As the passage of several years failed to produce any outstanding results from the official trials, the Department decided to make a general survey. The trials were all examined in 1949 and many other localities were also visited, the object being to secure as much information as possible about the environmental factors encouraging the spread of earthworms.

At the outset conditions favouring propagation of the trial species could be only guessed at, so the taking of soil samples wherever possible for quick-test analyses seemed desirable. As there were heavy demands on the analysts for this type of work, the taking of samples was restricted to situations most likely to produce useful information. For example, one pasture was sometimes found to contain a very small earthworm population while a nearby sward on a similar type of soil yielded high numbers of them; in such cases a soil sample was collected from each situation.

This survey showed, among other things, that *Allolobophora caliginosa* was much more widely spread in the country than had been suspected. A primary reason for the failure of most of the trials was that the species had reached many of the districts concerned before the experiments were begun.

One rather puzzling feature began to appear early in the investigations: In many situations where the species should have appeared it had failed to do so or was present in very small numbers. In the absence of any practicable method of determining the food supply, attention was directed to the soil type and to soil analysis. Some attempt was made to relate the presence or absence of *A. caliginosa* in any place to the state of the minerals; that is, those so-called "available" minerals which can be estimated by present quick-test procedure.

Earthworms and Minerals

Attention was concentrated mainly on the species being investigated, *A. caliginosa*, but consideration was given also to other species which appeared in the soil—in the main, members of an introduced European family, the *Lumbricidae*. At all places examined several square-foot samples of earth were dug and all the worms they contained collected carefully. These specimens were preserved in 3 per cent. formalin and the collections later examined to ensure that the field identifications were correct.

The densities of *A. caliginosa* in the tabulations of results which follow are shown as numbers per square foot. Each number represents the mean of several square-foot samples, usually three or four, which frequently were taken under conditions adverse for accurate sampling, so no high degree of statistical accuracy can be claimed for them as samples of a population.

The so-called quick test used extensively by soil chemists of the Department of Agriculture was applied in this survey. The test is used to analyse a soil sample for its content of the elements calcium, potassium, and phosphorus. The purpose is to show the quantities of these elements available for absorption by plants, and the test is designed to exclude non-available components from the result. In addition soil acidity is measured and expressed as units of pH, pH 7 being neutral, figures lower than 7 denoting degrees of acidity, and those above it denoting degrees of alkalinity. In this article figures for calcium are given as parts per 10,000 of oven-dried soil and those for phosphorus as parts per 100,000. The level of potassium (or potash) is indicated by the expressions "low", "medium", "high", and "very high".

Though available plant nutrients often vary widely in different soils, average fertile soils contain from 14 to 20 parts per 10,000 of calcium and from 5 to 10 parts per 100,000 of phosphorus, with potash contents ranging from high to very high. These three elements are by no means all the nutrients required by plants, nor is an analysis of the very important element nitrogen given by quick-test estimations.

Potash

The relation of the potash content of the soil to the densities of earthworms found in the survey is shown in the following table:—

Potash of soil status	Earthworms *A. caliginosa* (Mean numbers per square foot)				
	Absent	1 to 10	11 to 40	41 to 80	More than 80
Low ..	—	—	—	2	—
Medium ..	1	1	4	2	—
High ..	4	2	5	2	—
High to very high	—	4	1	—	1
Very high .	—	3	4	6	5

Though only 47 collections are tabulated, it seems clear that the potash level has no apparent direct effect on the earthworms. There seems no doubt that a very low potash level would restrict plant growth and thus limit the ultimate amount of available plant material, but no profound effect of this is discernible from the figures given. At low potash levels quite high densities of earthworms have been obtained, whereas in the five places where they failed to establish (but could have been expected to have done so because they were present elsewhere in the vicinity) the test gave medium and high potash values.

Phosphorus

Evidence in the following table seems to point to the fact that soil phosphorus is also a factor of no serious importance in earthworm distribution:—

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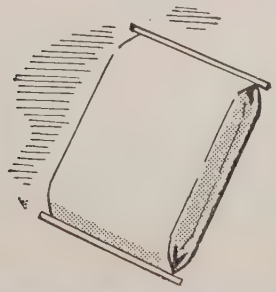

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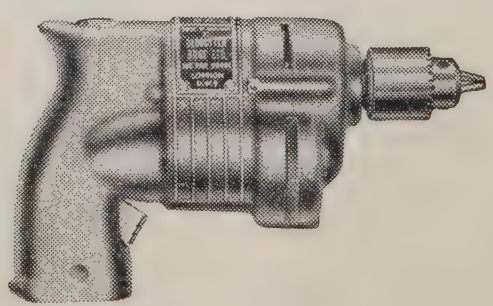

PNEUMATIC

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Phosphorus (as phosphorus pentoxide): Parts per 100,000 of oven-dried soil	Earthworms *A. caliginosa* (Mean numbers per square foot)				
	Absent	1 to 10	11 to 40	41 to 80	More than 80
Less than 1	—	5	—	2	1
1 to 1.5 ..	2	4	4	3	—
1.6 to 3 ..	2	1	4	3	2
3.1 to 5 ..	1	—	4	2	3
More than 5	—	—	2	2	—

Where *A. caliginosa* failed to appear phosphorus levels ranged between 1 and 5 parts per 100,000, yet high numbers were obtained at figures lower than 1. On Mr. Ashmore's property 95 *A. caliginosa* to the square foot were obtained in a pasture with a phosphorus value of 0.9.

Calcium

Figures for calcium show a rather different picture. The distribution of earthworms relative to the lime content of the soil is shown in the following table:—

Calcium: Parts per 10,000 of oven-dried soil	Earthworms *A. caliginosa* (Mean numbers per square foot)				
	Absent	1 to 10	11 to 40	41 to 80	More than 80
2	2	1	—	—	—
4	1	—	—	—	—
6	2	4	—	—	—
8	—	4	—	—	—
10	—	1	2	—	—
12	—	—	4	—	—
14	—	—	3	2	2
16 or more	—	—	5	10	4

Only one pasture with a calcium level below 6 parts per 10,000 contained any *A. caliginosa*. The exception was on one trial near Eketahuna, where two worms were found near the pegs marking the spot where they were originally placed in the soil; in all likelihood they were survivors of those introduced experimentally in 1945, as no more were found either at the pegs or in the surrounding pastures. However, collections from which *A. caliginosa* was absent yielded a few specimens of other species of introduced earthworms such as *Lumbricus rubellus* and *Octolasium cyaneum;* probably they are less sensitive to lime deficiency than *A. caliginosa.*

No soil having a calcium level of 8 parts per 10,000 had a density higher than 10 *A. caliginosa* per square foot, so a higher level than this seems essential if the earthworms are to be expected to thrive. However, the margin between the lime level deficient for worms and that at which they will flourish is quite small. A year's sampling on a grass plot with a calcium level of 12 parts per 10,000 at Rukuhia Soil Research Station gave an over-all average of 92 earthworms per square foot. No upper limit for lime is known, as a healthy colony of mixed species was found on a farm near Te Awamutu in soil which contained 36 parts of calcium per 10,000. The deficiency level seems to be constant regardless of the origin or structure of the soil.

Many references occur in writings to the fact that earthworms thrive only in soils either alkaline or near neutrality, writers seeming to place emphasis on soil acidity as expressed by pH. W. J. McL. Guild (1) in an earthworm survey of some farms in Scotland noted that certain pastures which had been limed a few years previously maintained a much higher population of earthworms than did unlimed, naturally acid pastures on the same farm. His conclusion was that: "Acid soil supporting rough herbage is not a suitable environment for a large, well-balanced population of worms." The present contention is that it is not soil acidity of itself but more specifically the shortage of calcium which discourages them.

The part this element plays in the physiology of earthworms is unknown. A good deal of the lime they ingest is excreted in the casts. J. D. Robertson (2) showed that the calciferous glands, which open into the forward part of the digestive tract, eliminate calcium from the bloodstream. Whatever the inorganic calcium salt he fed them, it was always converted in the body to calcium carbonate and secreted into the cavity of the gullet section of the tract. Organic forms of calcium did not lead to such excretion, as probably they were not assimilated. Certain uncompleted pot experiments at Rukuhia point to the possibility that a suitable level of soil calcium is needed not only to maintain the health of the earthworms, but also to permit normal rates of reproduction.

A major consequence of this need for calcium is that a large part of New Zealand lime-deficient soils will not derive the undoubted benefit of earthworm activity unless the concentration of calcium can be maintained at 10 parts per 10,000 or higher. Frequently a valley in which the soil is adequately supplied with both calcium and earthworms is bounded by hills and ridges which are so low in calcium as to prevent the existence of the worms. In such areas it seems unlikely that aerial or other topdressing with phosphate alone will induce migration from the lower, worm-populated pastures to the higher levels.

That *A. caliginosa* will spread given sufficient lime is shown by the fact that this species of its own accord has found its way into the tussock hinterland of Canterbury's mountains. On a shingle fan at the foot of a mountain near Cass where an analysis showed 12 parts of calcium per 10,000 of soil the worms are present at a density of about 10 to the square foot. Doubtless the hot, dry weather in summer will restrict their numbers, but the fact remains that they have spread there though 40 miles of rugged hill country lies between Cass and the pastures of the plains.

Water also Essential

Some half-dozen collections were omitted from the figures in the tables which have been given. These samples were taken mainly from very steep slopes in districts subject to summer droughts. The calcium level in each case was satisfactory, but the worms were either absent or there in only very small numbers. Field observations indicated that the supply of moisture was below that necessary for the maintenance of a healthy worm population.

An instance is provided by a farm near Tolaga Bay, where a survey showed that on the steep hill slopes the population of all species of earthworms was 9 per square foot, though a soil analysis gave satisfactory tests for potash and phosphate and the calcium content was 24 parts per 10,000. However, on one declivity was a damp hollow which appeared to receive moisture throughout the year by seepage from the slopes above. Here earthworms numbered 135 per square foot, of which 106 were *A. caliginosa*, yet the soil contained considerably less phosphate and only 16 parts of calcium per 10,000. Clearly, the moisture on the surrounding slopes was insufficient to support a bigger worm population, even though the soil minerals were in better supply than they were in the hollow. Moreover, as a result of the extra moisture the hollow would provide more forage throughout the year, which in turn would provide more food for the earthworms both from plant material and from manure dropped by sheep grazing there.

Other Minerals

The effects on earthworms of soil deficiencies or excesses of minor elements such as cobalt, manganese, iodine, and molybdenum apparently have not been studied. Among the many known toxic minerals, however, copper is familiar to greenkeepers as being useful in reducing the incidence of worms and hence of their casts. As copper sulphate is often used as a pasture dressing, it would seem of interest to know what level in the soil is tolerated by worms. No accurate experimental data are available, but at Rukuhia Soil Research Station an accidental overdose of soil copper permitted the making of a few observations. The overflow of a foot-rot bath for some time was allowed to filter across a pasture on the slope beneath it, and the soil in the direct path of the flow was deprived of all earthworms. Soil and population analyses produced the following information:—

	Approximate distance from centre of flow	Number of earthworms per square foot	Soil depth (in.)	Copper (parts per million)
Affected soil	4ft.	None	0 to 4	360
			4 to 8	256
	4 to 6ft.	2 to 6	0 to 4	266
			4 to 8	176
	6 to 10ft.	26 to 40	0 to 4	144
			4 to 8	66
Normal soil	100ft.	80 to 100	0 to 4	48
			4 to 8	40

A copper level near the surface of 260 parts per million was shown to be sufficiently toxic to remove the worm population almost entirely; those earthworms which survived had remained below the upper few inches of soil. Because of the rapid reduction in copper content with increasing depth an exact lethal value is difficult to assign from the figures. There is a further possibility that had these copper levels been maintained for a longer period, the earthworms would have been even more heavily reduced in number. Since these observations were made the overflow has been diverted into a safe channel. The toxic figures given considerably exceed those which could result from the usual pasture topdressing of copper sulphate.

1. "The Annals of Applied Biology" (London), volume 35, 1948, page 181.

2. "The Journal of Experimental Biology" (Edinburgh), volume 13, 1936, page 279.

Care of Livestock during January

Contributed by the Animal Research Division

WEANING is an important event in the life of a lamb and special care at this time will be well repaid. Long-wool lambs should be shorn and all others crutched.

WEANING LAMBS

Weaning is the most important time for drenching against worms, which is especially necessary in wet summers. A full dose of 20 gm. of phenothiazine should be given. If fattening crops are not available, lambs should be drafted into "clean" paddocks after being drenched. Lambs should never be weaned into paddocks in which ewes and lambs have been grazed during the previous month. Unless very good paddocks of spelled pasture are available, hoggets should be spread thinly over as large an area as possible.

CULLING OF EWES

After lambs have been weaned the ewes should be gone through carefully to select those which require culling. Teeth, feet, and wool should be examined carefully. Special attention should be paid to udders and teats, and ewes should be culled if they have defective udders or very large or damaged teats, as the lambs of such ewes often die from starvation before they are a week old. Condition is a poor guide to culling, as the ewes which have not reared a lamb are always in the best condition. Ewes should be kept on low rations during the next 2 months to prevent their becoming too fat.

ERADICATION OF FOOT-ROT

Campaigns for foot-rot eradication should be started as soon as the lambs have been weaned. Once foot-rot has been eradicated from a flock it does not recur unless it is reintroduced from outside. Department of Agriculture Bulletin No. 325, "Foot-rot in Sheep Can be Eradicated", gives full instructions for such campaigns.

ERGOTISED GRASS MAKES DANGEROUS HAY

Serious lameness in cattle can be caused by their eating hay heavily infested with ergot. Such hay can be easily recognised by the black ergots which replace the seeds of ryegrass and other grasses. Where ergot is known to occur hay should be made before the grasses have time to seed.

DIPPING OF SHEEP

Modern sheep dips are so effective that the eradication of lice and ticks should be quite feasible. However, best results will be achieved only if the instructions for mixing and replenishing dips are followed accurately. Carelessness in dipping can cause disastrous losses. If sheep are dipped off shears, the shear cuts are likely to become infected and deaths from blood poisoning may occur, but this can be prevented by vaccinating the sheep with blackleg vaccine at least a fortnight before dipping them. The vaccine is available at a reasonable price. Departmental Veterinarians or Inspectors of Stock should be consulted about its use.

ST. JOHN'S WORT MAKES DIPPING DANGEROUS

Sheep that eat St. John's wort become sensitive to sunlight and develop scabs on the ears, face, and back. If sheep in such a condition are dipped, they take convulsions and may be drowned. If possible, sheep should be grazed on country free from St. John's wort for several weeks before they are dipped. If that is not possible, they should be dipped only on dull days.

FODDERS FOR LAMB FATTENING

Rape should not be grazed by lambs until the leaves show a purplish tinge. "Unripe" rape does not fatten lambs so quickly and seems to "scald" them more readily. Best results are probably obtained by grazing rape in breaks which last the lambs about a week. Keeping lambs on a break until the last leaf is eaten is false economy; they should be moved on while they are still getting a full feed, and the paddock can be cleaned up with ewes. Run-offs have little to recommend them, and unless they contain good pasture they will depress the lambs' rate of growth. If hay is fed, it must be of the best quality. Thousand-headed kale is splendid lamb-fattening fodder, but because it is relatively unpalatable it must be managed properly. It must always be fed in small breaks and grazed only lightly before the lambs are moved on to the next break. Use of a run-off is not advised. Treated in this way, the kale makes excellent regrowth and can be grazed several times; if necessary, the grazing can be extended into autumn and winter.

Dairy Produce Graded for Export

THE following figures showing quantities of dairy produce graded for export during October and for the 3 months ended 31 October 1951 with comparative figures for the same month and 3-monthly period of 1950, have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:—

BUTTER

Period	Creamery	Tons Whey	Total	% Inc. or dec.	Total tons in store at end of mth.
October 1951 ..	22,196	366	22,562	—	18,677
October 1950 ..	20,886	391	21,277	—	31,419
Inc. or dec. ..	+1,310	—25	+1,285	+6.039	—12,742
For 3 mths. to 31/10/51 ..	44,462	713	45,175	—	—
For 3 mths. to 31/10/50 ..	43,936	786	44,722	—	—
Inc. or dec. ..	+526	—73	+453	+1.012	—

CHEESE

Period	White	Tons Coloured	Total	% Inc. or dec.	Total tons in store at end of mth.
October 1951 ..	11,590	8	11,598	—	12,197
October 1950 ..	12,631	—	12,631	—	17,259
Inc. or dec. ..	—1,041	+8	—1,033	—8.178	—5,062
For 3 mths. to 31/10/51 ..	19,415	10	19,425	—	—
For 3 mths. to 31/10/50 ..	20,701	1,223	21,924	—	—
Inc. or dec. ..	—1,286	—1,213	—2,499	—11.398	—

If these figures are converted into butterfat equivalent there is a decrease of 1.194 per cent. in butterfat graded for the 3 months as compared with the corresponding period of the preceding season. It should be noted that the above figures refer only to butter and cheese graded for export, and that owing to diversions which may take place from time to time, they are not necessarily a true indication of production trends.

Wheat Yields: Pasture Mixtures: Supplementary Feed

Seasonal Notes by the Extension Division

BEFORE THE END of one cropping season plans must be made for the next, and consideration should now be given to the 1952-53 wheat crop. A great deal of investigational work has been carried out into the breeding of improved wheat varieties, fertiliser requirements, and, more recently, yield in relation to place in rotation.

CROP ROTATIONS AND WHEAT YIELDS

Farmers in two areas, one near Christchurch comprising the Templeton, Yaldhurst, Broadfields, Prebbleton, Springston, and Lincoln districts, and the other near Ashburton comprising Methven, Highbank, Lauriston, Winchmore, and Rakaia, have been co-operating with the Department of Agriculture for several years in a survey to measure the effects of various factors on yields of wheat crops. One of these factors was the rotation of crops in the fields immediately before the wheat crop. Results indicate that best yields are obtained from wheat after grass or where it is grown in a grass: peas: wheat rotation. This rotation is used to some extent in the Ashburton area, but is rare in the Christchurch area. The yield of wheat 2 years after grass is about 3 bushels per acre better than that from wheat after 2 years of crops. Further, where a second wheat crop is taken in a cropping rotation the yield is less than that of a crop immediately after grass by about 7 bushels per acre in the Christchurch area of the survey and by about 4 bushels per acre in the Ashburton area. In the Ashburton area nearly half of the wheat crop was taken after grass and about a quarter in the rotation grass: fed-off crop: wheat; in the Christchurch area no single rotation was predominant.

* * *

AUTUMN-SOWN PASTURES

SEED MIXTURES for autumn sowing of pastures should be based on a knowledge of the soil condition and the purpose for which the pasture is being sown. On soils of high fertility both short-rotation ryegrass and perennial ryegrass should be sown with white clover. Cocksfoot and timothy are worth including on dairy-farming land where grazing is not likely to be close and continuous. Paspalum should be included in autumn sowings in the warmer districts, even though it will not be prominent for about 3 years. Prairie grass is useful on rich soils and in warm climates as a winter-producing feed for rotationally grazed dairy pastures.

SHORT-ROTATION RYEGRASS

The greatest value of short-rotation ryegrass is in its winter and early-spring production, for which purpose it should comprise half of the total ryegrass sown. On lower-fertility soils the proportion should be reduced to a quarter of the total. Where seed production is intended short-rotation ryegrass and perennial ryegrass should be sown separately. Short-rotation ryegrass dies out fairly rapidly under close, continuous grazing, but has lasted for 9 years as a useful component in a pasture which has been grazed by sheep and spelled regularly.

CHEAP SEED

Seed for sowing down of pastures should be able to germinate and to produce the type of plants desired. Many of the so-called cheap seed mixtures contain only a small proportion of the species that are required, and germination percentages of these frequently are low. The remainder consists of inert matter such as straw and husks, weed seeds, and seeds of plants which, though not harmful, are not desirable. Cheap seed mixtures are often made up from low-germinating and impure lines of commercial seeds that do not find a market through the usual trade channels. Therefore their composition makes them cheap on the basis of price per pound, but expensive on the basis of the amount of useful seed per pound. On poor, unploughable country much more care in the selection of a seed mixture is necessary than on good country, because there is seldom any chance of resowing after a failure. Whereever possible Certified seed with a high germinating capacity should be sown.

SEEDS MIXTURE FOR MANUKA BURNS

In preparation for secondary sowings manuka should be cut in spring and early summer and burnt in autumn. Seed should be sown in the ashes of the burn at the rate of about 25lb. per acre of the following mixture: Perennial ryegrass 10lb., cocksfoot 4lb., crested dogstail 3lb., browntop 2lb., danthonia 3lb., white clover 2lb., Tallarook subterranean clover 3lb., and *Lotus major* 1lb. Certified seed of species of which it is available should be used. Cocksfoot requires a considerable ash covering for successful establishment. Browntop, *Lotus major*, and white clover do best on the shady faces, and danthonia and subterranean clover are more suited to sunny faces. Application of 2 to 3cwt. of superphosphate compound or serpentine superphosphate should precede sowing. Quicker establishment may result from a heavier seeding and fertiliser application, but the cost may not be recouped. Sown as recommended, the pasture will build up in time if it is occasionally permitted to run to short seeds and is leniently grazed during the first winter and spring.

Japanese millet is a useful greenfeed catch crop for rationing to dairy cows.

* * *

SUPPLEMENTARY FEED FOR DAIRY HERDS

PRODUCTION from the dairy herd normally falls off rapidly in the latter half of the lactation period unless milk-producing feed is provided to sustain the milk flow. In an all-grass dairy-farming system good silage is very useful as a milk-producing feed during this period, and sufficient should be saved for both summer and winter. Effects of a dry spell may not be felt with herds rotationally grazed while paddocks are carrying good growth, but when the next round is begun after this grass has been eaten little milk production can be expected from desiccated pastures grazed during the dry spell. If dairy production is to be sustained, supplementary feeding must be started in good time. This will allow the grass grown before the dry spell to last longer.

JAPANESE MILLET

Sown in late November-early December, Japanese millet is a useful greenfeed catch crop for rationing to dairy cows. Millet grows rapidly under fertile conditions and can be grazed when 6 to 12in. high, preferably in breaks providing 1 to 2 hours' feeding daily. Successive grazings will maintain milk production throughout January and February before the land is sown down to grass in March. If millet is allowed to get away to seed head, the herd cannot cope with the crop, feed is trampled, and production drops. The millet may then be ensiled or hayed, but soil fertility is lowered considerably and the ground is left in a very unfavourable condition for being sown down to grass.

Origin of Red Strains of Apples in Hawkes Bay

RED strains of striped or partial red varieties of apples are numerous and are being discovered from time to time in many parts of the world. New Zealand has produced a considerable number of these types. Red Dougherty, Red Jonathan, and Red Delicious have been produced in the Hawkes Bay district and brief references to their origin are given in this article by R. I. June, Orchard Instructor, Department of Agriculture, Hastings.

MANY new varieties of fruits are developed by man by crossing one variety with another, but a great many are the product of bud mutations and are commonly called "bud sports" or simply "sports". Red varieties developed in this way include the red sports of Delicious, Cox's Orange Pippin, Statesman, Northern Spy, Dougherty, and Jonathan. There are other red varieties which do not show by name their connection with the parent variety, such as Frimley Beauty and Glengyle Red, which are bud sports from Rome Beauty.

Occurrence of Bud Mutations

There is still a considerable amount of information to be obtained on the exact cause of the development of certain buds which behave in a different way from all others on the same plant. In many plants, including fruit trees, changes in cell structure can be brought about by extremes of climatic conditions, injury, pruning, or even a sudden change in nutrition. Bud mutations have also been produced on certain plants by subjecting them to X rays.

Bud mutations are fairly numerous and of considerable importance in the commercial propagation of fruit trees. They may be desirable or undesirable. The desirable characteristic can be one of colour, quality, vigour of growth, fruit shape, size, texture, or time of maturity. It is usually only when extreme variations in shape or colour of fruit occur that the casual observer takes particular notice of them.

To be certain that a variation is a bud sport it is necessary to find out whether its characteristics can be perpetuated by budding or grafting. Budding or grafting the sport on to trees is preferable for the testing period, as less time is required for top-worked trees to come into production. Budding on to stocks in the nursery may, however, give a better idea of growth habit. As this may be of importance in the ultimate commercial value of the strain, it should be carried out at the same time.

Red Delicious

Numerous Red Delicious strains, some superior to others, have been produced in many parts of the world. The Red Delicious propagated by the New Zealand Fruitgrowers' Federation at Levin for distribution throughout the country is propagated from a red sport of Delicious discovered in Hawkes Bay by Mr. R. W. Law. It is known as the Law strain of Red Delicious and is of fine quality.

Mr. Law discovered this bud sport in the late 1920's. About half a tree was seen to have fruit of a high colour. Wood from the tree was worked on other trees and produced fruit true to type. Since then it has been widely distributed and has found favour with fruit growers and consumers alike. It is of fine appearance and of good keeping quality.

Red Dougherty

A Red Dougherty was discovered by Mr. C. F. Bixley in the Twyford district, Hawkes Bay. On one tree of a block of Dougherty it was first noticed as a small limb which produced bright solid-red fruit, colouring well in advance of any surrounding it. It was discovered in the late 1920's and in 1930, after it was found to be producing similar fruit each year, it was grafted on a tree in the centre of the original Dougherty block.

The resultant growth was very vigorous and fruit produced in the second year was found to be fully coloured by the end of March. By the end of April it stood out brightly against the dark green of the foliage in marked contrast to the surrounding Dougherty trees. Even the fruit shaded by heavy foliage developed a solid-red colour.

Mr. Bixley realised that his find had great possibilities. Because of its early and practically complete colouring Red Dougherty could be almost entirely harvested and packed for export ahead of Dougherty, for colour, rather than maturity, often retards picking of the ordinary variety. This alone was a great improvement, as in certain seasons it is often difficult to obtain sufficient colour in time for the export season, and there is consequently a loss in grade of fruit that will not colour enough to qualify for fancy grade. It also tended to shorten the picking season, as the ordinary Dougherty is one of the last to be harvested in Hawkes Bay, and the season is often extended into wet weather while the grower is waiting for colour to develop in his fruit.

With its deep dark-red skin the fruit of Red Dougherty is excellent in appearance. Its flavour is satisfactory, but it has proved more subject to storage scald than the original Dougherty. This fruit has been worked on a range of stocks and is now grown in considerable quantity

Other Red Dougherty trees have been produced in New Zealand, one in Hawkes Bay and one in Kokaho which has also been propagated to a considerable extent.

Red Jonathan

In 1929 Mr. A. Tomlinson, of Frimley, noticed two unusually well-coloured Jonathan apples on a low branch. Mr. Tomlinson took the small shoot of about 3in. in length and grafted it on other trees. These grafts produced fruit of similar quality and possessed the high colour of the two fruits first seen, proving that the distinctive characters were retained after propagation.

The apple was named "Kapai Red Jonathan", but is often referred to as "Kapai Red" or "Red Jonathan". Mr. Tomlinson gave the apple the name Kapai with the idea of making it known in other parts of the world as a New Zealand variety.

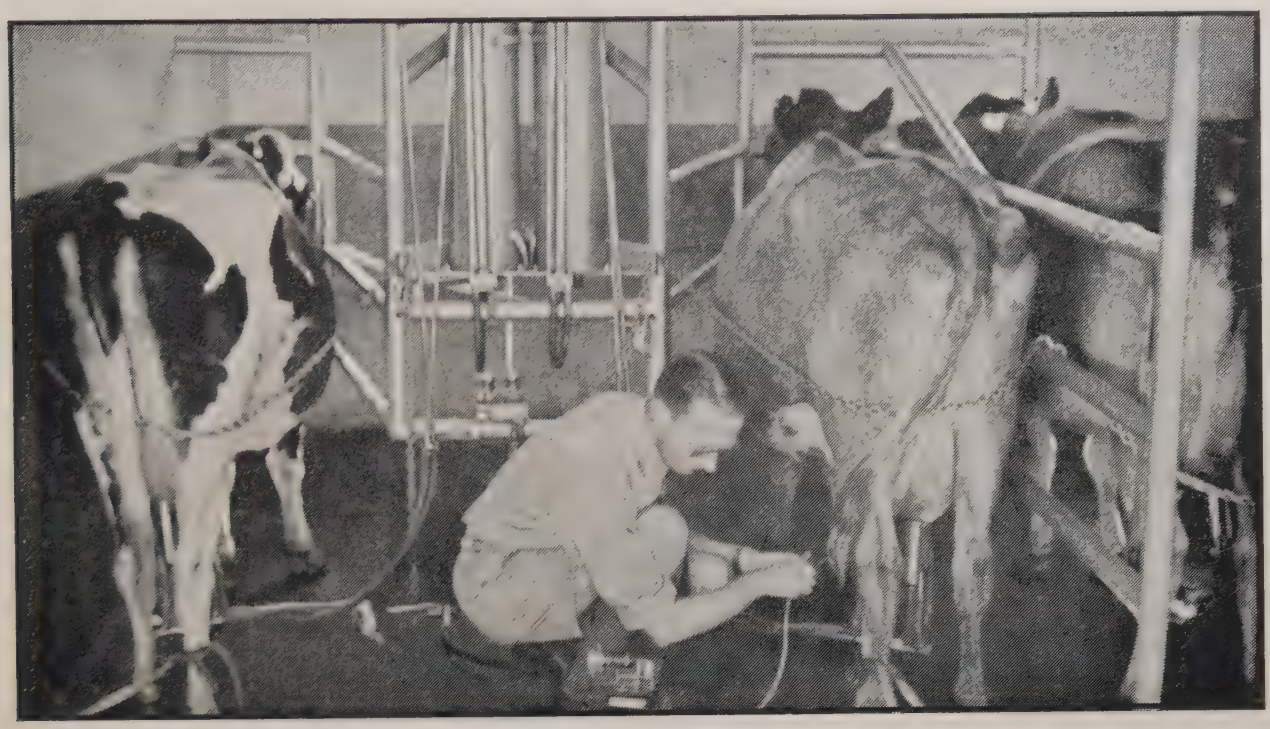
Having had nursery experience himself, the owner developed this apple for a few years, but later handed it over to a Hastings nurseryman for further development and distribution. This was done on the understanding that the trees would be sold at the price ruling for other varieties, as it was the owner's wish that other growers should have the advantage of his find without undue cost.

Acknowledgment

The assistance of Messrs. Bixley, Law, and Tomlinson in the preparation of this article is acknowledged.

[R. W. Orr photo.

Ordinary Dougherty (left) and Red Dougherty (right).



Testing the Efficiency of Milking Machines

EFFICIENCY of mechanical milking is a subject on which much attention has been focused in recent years. The farmer trying to improve his milking has been faced with the difficult problem of deciding whether his machine is doing its work properly, but there has been no simple way of measuring machine efficiency; in fact, the requirements of a good machine have been but poorly understood. As a consequence the farmer has been largely at the mercy of opinion, and opinions have varied between farmers and between makers of machines. The result has been most unsatisfactory and confusing to the farmer, leading to considerable unnecessary expenditure and increased trouble with milking. This article, based on a paper given by D. S. M. Phillips, Physicist, Department of Agriculture Animal Research Station, Ruakura, to this year's Farmers' Conference week at Ruakura, discusses faults in the machine which have an effect on milking and shows how those faults, though not easily observed, can be detected readily by a trained serviceman using instruments designed for the purpose.

SEVERAL years of careful study at Ruakura have been given to an effort to find the factors in the milking process which can affect the efficiency of milking and how the machine can influence the milking of the cows. In general, this work has shown that the most important influences in the milking machine are not constructional differences which can be seen from the outside, but what occurs inside the machine while it is milking.

Factors Affecting Milking

Foremost among factors which contribute to the efficiency of milking is the reaction of the cow to the milking process. Research has shown that regularity of shed conditions for the cow is far more important than adjustments to the machine. Ensuring that the same thing happens to the cow at each milking and that the machine feels the same to her is more important than having the pulsator ratio or the milking vacuum at some specified value. Only when the machine and the shed routine seem the same to the cow at each milking will she behave her best in letting down her milk and standing quietly in the bail. An unstable machine or an irregular shed routine results in irregular behaviour of the cow, causing loss of production and an increase in the time spent in the shed.

Factors which affect milking can be summarised into the following four groups:—

Milker: Cups left on too long, resulting in slow milking.

Milker and cow: Irregular shed methods and bad treatment of cows, resulting in poor let-down, loss of production, and slow milking.

Machine: Vacuum level, pulsator ratio, high or low lines, and stripping gadgets all have a comparatively small effect on milking.

Machine and cow: Differences between bails, irregular machine action, unstable vacuum, and discomfort of teat-cups, resulting in poor let-down, loss of production, and slow milking.

Influence of Milker

The milker has a considerable effect on the efficiency of milking. He may be slow in the shed or he may leave the cups on too long in the belief that he will finally obtain all the milk.

Such troubles can be reduced by adopting a simple, fixed shed routine and by using some form of indicator which decides automatically when the cow has finished milking. This is more important where milkers are employees who do not have a direct interest in the cows.

The Shed Routine

The influence of the farmer and his shed methods on the cow cannot be overestimated. Efficient milking depends primarily on the man in the shed, his treatment of the cows, and his ability to devise and maintain a simple and regular shed routine.

The essentials of a good shed routine are:—

Good treatment of the cows.

Brief but effective washing of the udder as a stimulus to let-down.

Use of a strip-cup to test foremilk from each quarter for the detection of mastitis and as a positive stimulus to let-down.

Putting on of the cups soon after washing.

Removal of the cups as soon as the cow stops milking.

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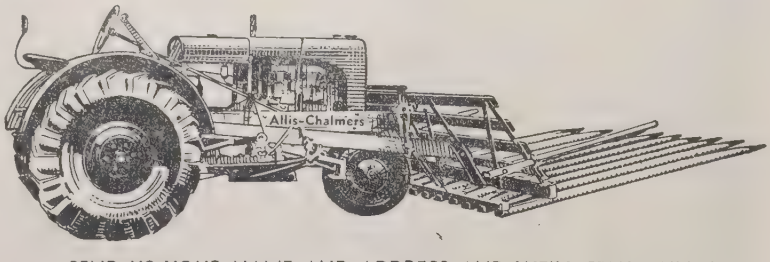

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Design of Machine

The machine plays a small part in milking efficiency. Certain factors in construction and design, such as pulsator ratio, high and low lines, and patent devices to improve milking have a small effect on the rate of milking, but it is quite unimportant unless efficiency has already been brought to a high standard by the use of a careful shed routine.

Reaction of Cows to Machine

The effect of the machine on the cow is important for two reasons: First, a bad machine will upset the cows and the shed routine by its irregular action, and, second, the efficiency of the machine has an effect on the milker.

If a farmer has no confidence in his milking machine, he will blame it for any troubles and overlook faults in his handling of the cows and in his shed methods. On the other hand, a farmer who is certain that his machine is in first-class order will know that the cause of trouble must be sought elsewhere and will give more attention to his shed methods, which are responsible for most troubles.

Effects of Faulty Machine

A faulty machine can upset the regularity of milking because of its inability to present to the cow the same milking conditions at each milking. Cows vary greatly in temperament, and what one cow may tolerate quite well may completely upset another.

Factors which can upset the milking conditions are differences between bails, defective inflations, irregular machine vacuum, and changes in the vacuum level.

Bails may differ in many respects, including the pulsators, the state of the cups, or the sounds the cow hears. Some bails may have slippery patches on the floor or a steep step outside the door. All these differences would be unimportant if each cow had her own bail. However, in most sheds a cow may be milked in any bail, and these differences can produce a feeling of uncertainty about the whole process of milking which does not help the cow to feel at home in the bail.

These things do not affect all cows to the same extent, but even the quietest cow can have her let-down upset by some happening which may appear insignificant to the milker. Dislike of certain bails may be so great that cows cannot be induced to go in. If they are forced to enter, the result is a poor let-down and either a slow, "strippy" milking or loss of production.

It is important that differences between bails be kept as small as possible and especially that the action of the machine be the same in each bail.

Old inflations with flabby or torn lips usually cause a lot of slipping and falling of the cups, which has a bad effect on the cow and more particularly on the shed routine. Such an upset affects all the cows in the bail and not only the cow concerned. Keeping all cups and inflations in good order eliminates another possible source of trouble.

To the cow the teat-cups are the milking machine and the mechanical action and vacuum changes which occur inside the cups are the only things which affect her directly. If the machine is to seem the same to the cow at each milking, the movements and vacuum changes in the cups must be constant throughout each milking and at every milking. The action in the cups must be constant and must not alter when some fast milkers are in the bails or when cups are being changed. A machine vacuum stable under all conditions and regular action of the pulsators are needed.

Unstable machine action is extremely common and is probably the most important fault in the type of machine used in New Zealand. The causes of such action are numerous and often difficult to detect unless special instruments are used, as in many machines the irregular action cannot be seen from the outside and often does not occur until some stage in the milking. The commonest causes are:—

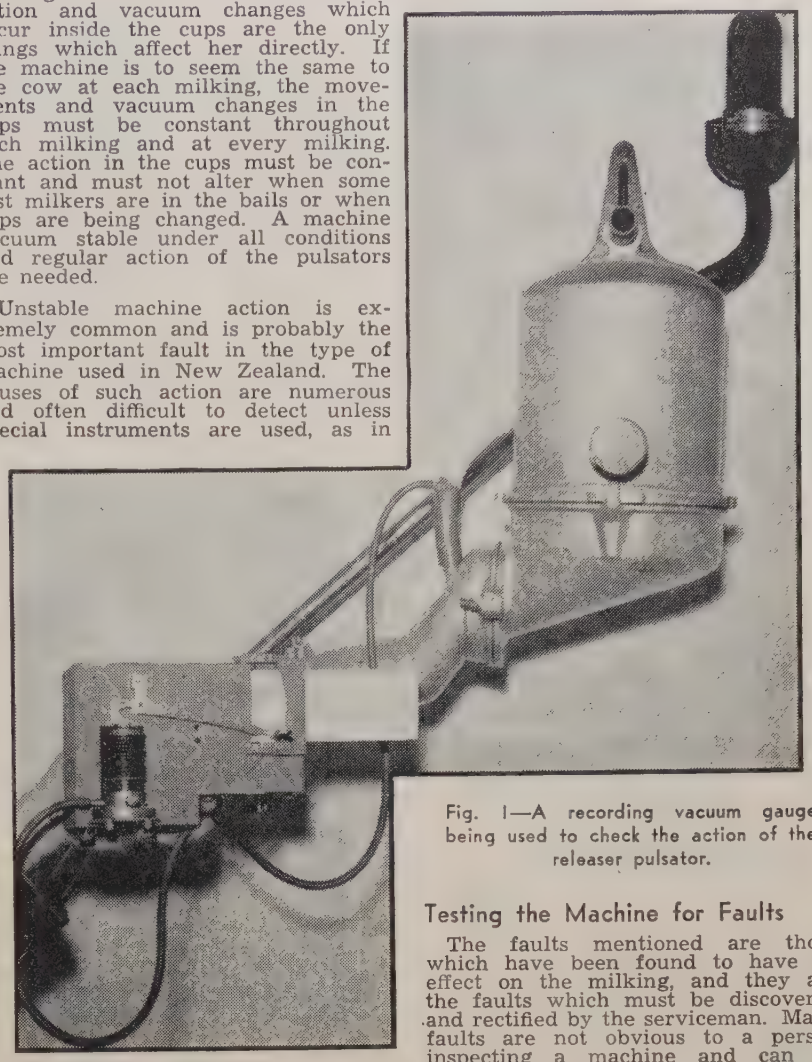

Fig. 1—A recording vacuum gauge being used to check the action of the releaser pulsator.

Low reserve of air (normally drawn in through the relief valve), caused by the vacuum pump being too slow or leaking, the relief valve being of a poor type or tending to stick and needing attention, or undue leaks in the machine at joins and rubber seals or at the cups.

Milk not flowing steadily in the milk-line because of flooding of the releaser caused by faulty flaps, a blocked pulsator lead, a poor pulsator, incorrect pulsator ratio, pulsator too far from the releaser, too small a milk-line inlet to the releaser resulting in blockage to air flow, or incorrect slope of the milk-line.

Another common fault is alteration of the vacuum level from day to day caused by the relief valve becoming stuck in different places. If not given frequent attention, many types of relief valves will stick because of accumulation of dirt and rust, and the vacuum setting will then be most unreliable.

Testing the Machine for Faults

The faults mentioned are those which have been found to have an effect on the milking, and they are the faults which must be discovered and rectified by the serviceman. Many faults are not obvious to a person inspecting a machine and can be found only when its operation is checked by special methods, preferably during milking. Much work in the detection of faults in farmers' machines has led to the designing of relatively simple instruments which, when used by a trained serviceman, can locate sources of trouble readily. These instruments must be used in conjunction with figures for such factors as the size of the plant which have been found from experiments to give the necessary standard of operation. Such instruments cannot be obtained commercially, but will need to be manufactured before the methods of test can be put into general use.

The type of instrument which makes possible quick and accurate checking of the action of the pulsators is shown in Fig. 1. It records the pulsator vacuum level on a moving strip of paper. When connected to the pulsation lead of a set of teat-cups it gives an immediate check on the pulsation, allowing the serviceman to detect faults and to ensure that all pulsators in the shed are operating in the same way. A simpler version of this instrument would be very useful for testing machines.

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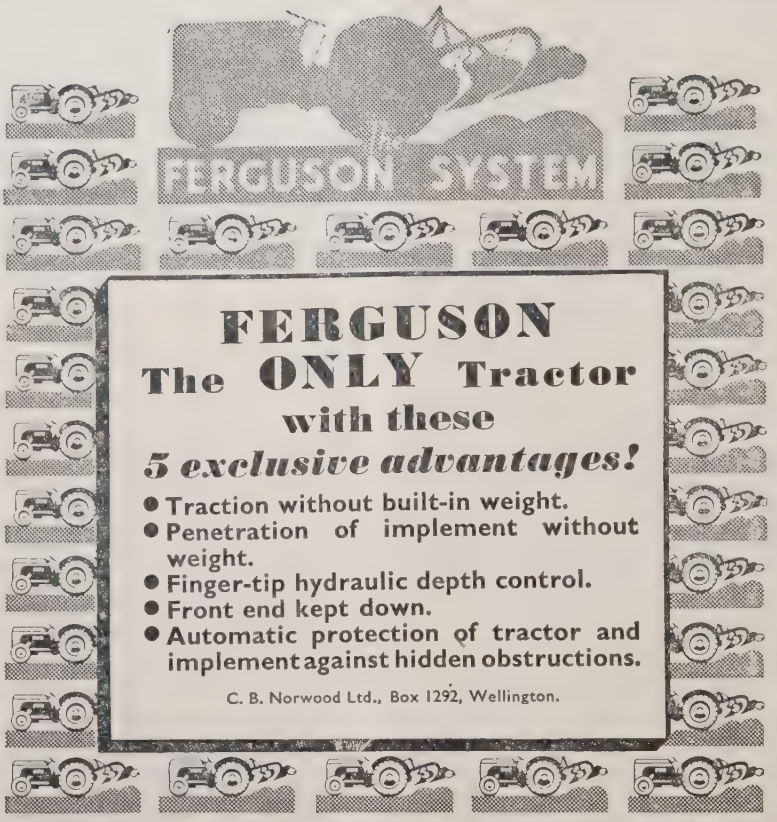

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Points to check in the teat-cups if they are to do their best are shown in Fig. 2. Inflations should not be slack or flabby. The mouthpiece should be even and the lips should not be flabby or cut. The state of the mouthpiece of the cup is very important to prevent slipping and falling of the cups and resultant leaks. Flabby lips tend to allow cups to fall easily and cause excessive crawling and resultant machine stripping. The pulsation chamber must be clear of water, which causes changes in pulsator action, and leaks at the bases of the cups cause air to be wasted.

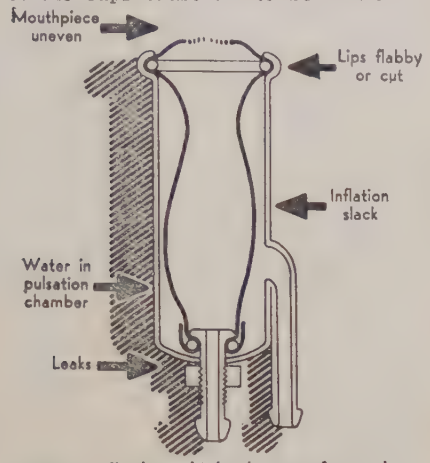
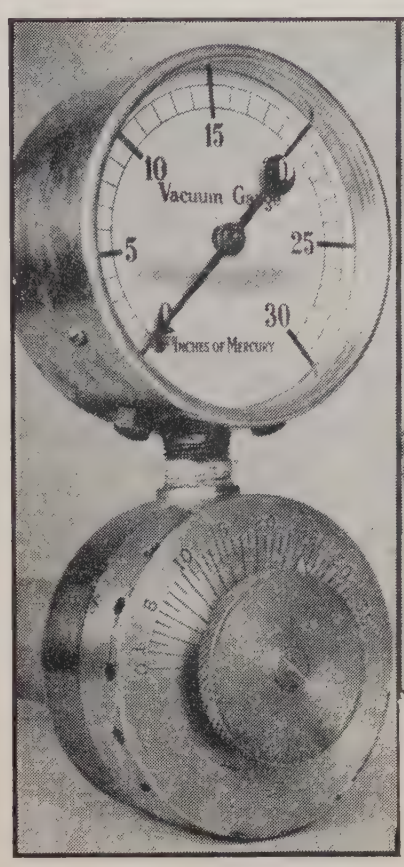


Fig. 2—Faults which detract from the efficiency of teat-cups.

The effect of leaks on reserve air is shown in Fig. 3, which gives the amount of air used by the parts of a 4-cow doubled-up plant in a correctly working machine and in a typical farmer's machine which is in need of attention. In the "correct" machine the reserve of air is ample to maintain a steady vacuum, but in the other the reserve is nothing, resulting in unstable vacuum level and poor milking. A small leak can let in a lot of air and the air coming through a 1/16in. hole is costing the farmer 2s. to 3s. a month in power.



The efficiency of the vacuum pump also has an effect. The pump speed necessary for the good plant exemplified in Fig. 3 is 260 revolutions per minute, giving a pumping capacity of 28 cub. ft. of air per minute. In the poor machine the pump is running at 300 r.p.m. but delivering only the same amount of air, showing that it is leaking. This higher pump speed uses more power to no purpose.

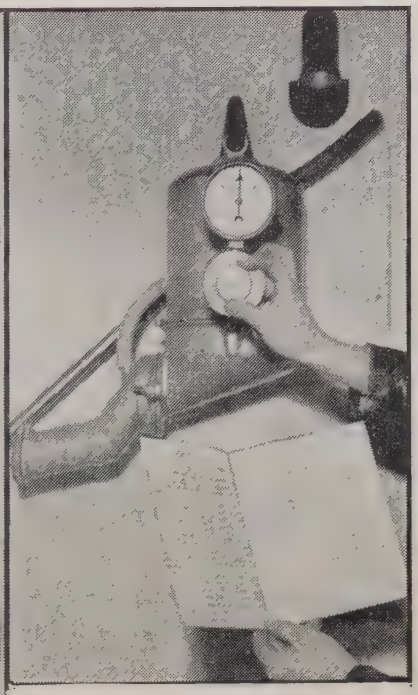


Fig. 4—Left: An air-flow meter developed at Ruakura Animal Research Station. Above: The device plugged into the machine to measure air consumption, reserve air, and capacity of the pump. The meter readings are compared with a chart giving correct figures for the machine.

Vacuum readings are very unreliable and misleading when used to test a machine for air consumption and reserve air, and a meter which will measure the flow of air directly is most desirable. It is hoped that a simple meter of the type shown in Fig. 4 will soon be available for use by servicemen.

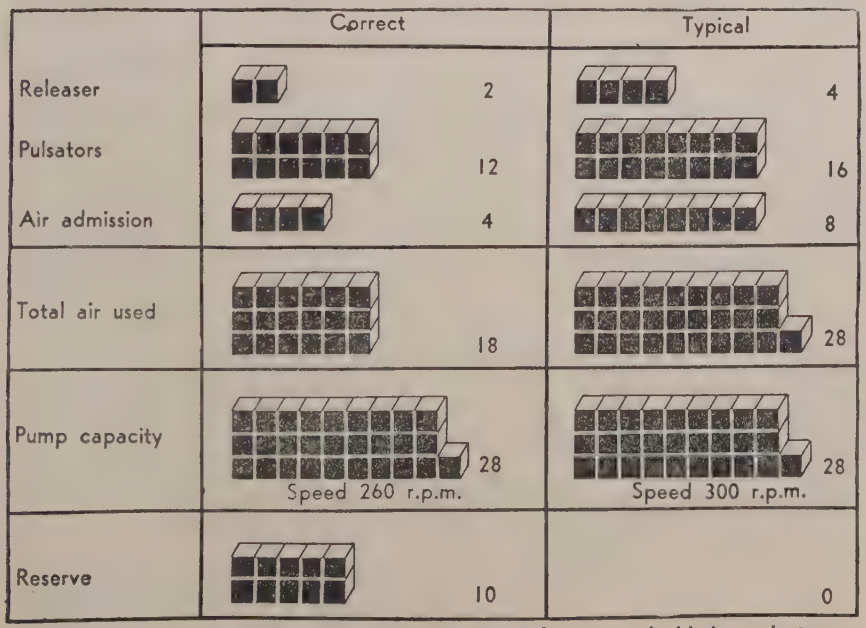


Fig. 3—Air-flow figures in cubic feet per minute for 4-cow doubled-up plants.

Operation of Relief Valve

The relief valve has a particularly important role in the maintenance of a steady vacuum. The vacuum pump is continually pumping air out of the machine, and the pulsators, air admissions, and leaks are letting air in. To maintain a steady vacuum the pump is made to pump a little faster than necessary and the extra air is drawn in through the relief valve, which should open and close in such a way that this "spare" or "reserve" air is made available when necessary to cope with leaks and at the same time the vacuum level is prevented from changing. This is a very difficult task, and to do it properly the relief valve must have an ample supply of reserve air. No relief valve, however good, can control the vacuum when no reserve air remains. As about three out of four farmers' machines are working with insufficient reserve air, most relief valves have no chance to do their work and good and bad valves alike are getting a bad name.

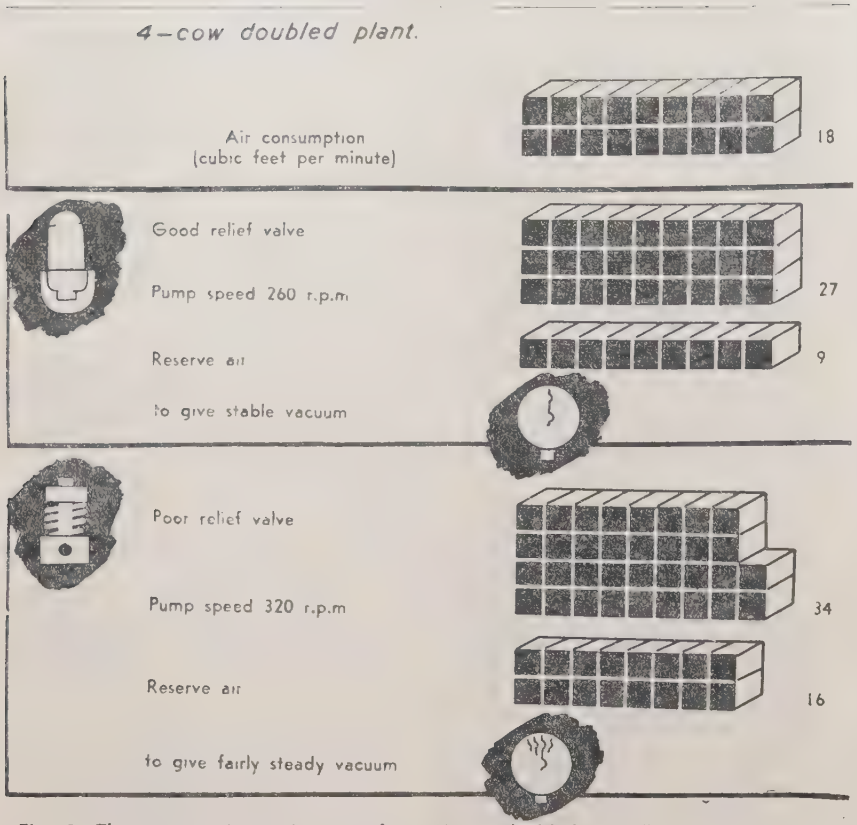


Fig. 5—The reserve air requirements for a 4-cow doubled-up milking plant to give comparable performances with a good and a poor relief valve.

However, when the reserve of air is sufficient a good relief valve will maintain the vacuum far better than will a poor one, a point illustrated in Fig. 5. A good relief valve with a relatively small reserve of air can keep a steady vacuum, which cannot be done by a poor relief valve with nearly twice the reserve. An average 4-cow doubled-up plant uses 18 cub. ft. of air per minute. With a reserve of 9 cub. ft. per minute a good valve can keep the vacuum level constant provided milking proceeds normally. However, a poor type of valve with a reserve of 16 cub. ft. per minute would still be unable to keep the vacuum constant under the same conditions.

A poor relief valve can undo all the effect of blocking leaks and speeding up the pump. A poor relief valve does, in fact, behave as a very bad leak.

The relief valve can be checked easily and accurately with an air-flow meter.

Flow in the Milk-line

The major causes of unstable flow of milk in the milk-line and resultant irregular vacuum at the cups are shown in Fig. 6. The flow of milk in the milk-line normally is smooth and fills only the lower third of the pipe, the remainder of the pipe being occupied by the stream of air from the air-admission holes, amounting to about six times the volume of milk. This smooth flow is upset if the milk is shot down the pipe in waves, causing low and unsteady vacuum at the cups. Causes of this surging are flooding of the releaser, causing the milk level to rise to the level of the milk-line inlet; too small a hole at the milk-line inlet to the releaser, resulting in blockage of the air trying to escape from the milk-line; and incorrect slope or sagging in the milk-line.

Releaser flooding is the least obvious of these causes, as what is happening inside the releaser when it is working cannot be seen. It can be caused by the releaser flaps not seating properly, resulting in delay to their opening or closing; the releaser pulsator lead being blocked or the pipe being too long or too small, causing the flaps to be slow in opening; or by the releaser pulsator being at a point of low vacuum, having an incorrect ratio, or having ports too small or incorrectly spaced.

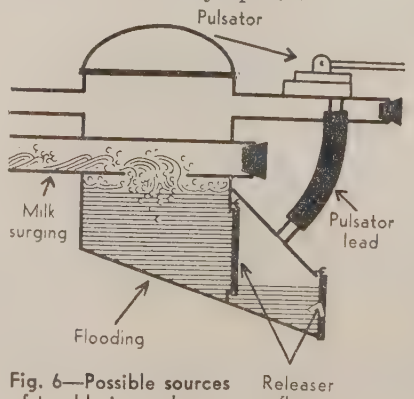


Fig. 6—Possible sources of trouble in a releaser.

The only reliable method of finding these faults has been found to be the making of a recording of the vacuum in the releaser spit-chamber while it is working, using a recording vacuum gauge as illustrated in Fig. 1. Some releaser faults are very difficult to find in any other way.

Installation of Devices

Many of the important faults in milking machines are rather obscure and difficult to detect unless special methods and instruments are used, and as a result they frequently remain undetected and unsuspected. The trained serviceman has other duties as well as making these tests of machine action. He must understand how different parts will affect the action of the machine and must be able to give impartial advice about the installation and use of new devices which are marketed. For example, the vacuum regulator and milking indicator developed at Ruakura have frequently been installed incorrectly, resulting in bad performance and damage.

Fig. 1 shows the vacuum regulator mounted correctly—on a firm wall, on the air line near the releaser or vacuum tank, above the air line, where water will not collect in it, and connected to the machine by the full length of rubber tubing provided and through a full-sized $\frac{3}{8}$in. fitting. Failure to observe these provisions will result in unstable action and poor performance.

The milking indicator is best mounted on a 2in. x 2in. board across the dummy, away from the floor but not too high, and where it is visible from all parts of the shed. The indicator should be used as an indication first of when to machine strip (when the window begins to clear) and finally of when the cow is completely milked out (when the window is empty).

Reliable and accurate advice about the use of such devices should be available to farmers through their machine servicemen.

Possible Servicing Schemes

Before the data and instruments developed at Ruakura Animal Research Station can be put to their best use a scheme must be devised to bring the benefits of testing and servicing milking machines to the farmer. How such a scheme could be organised has yet to be considered. Some of the possibilities are:—

Testing by the Department of Agriculture; servicing by commercial firms.

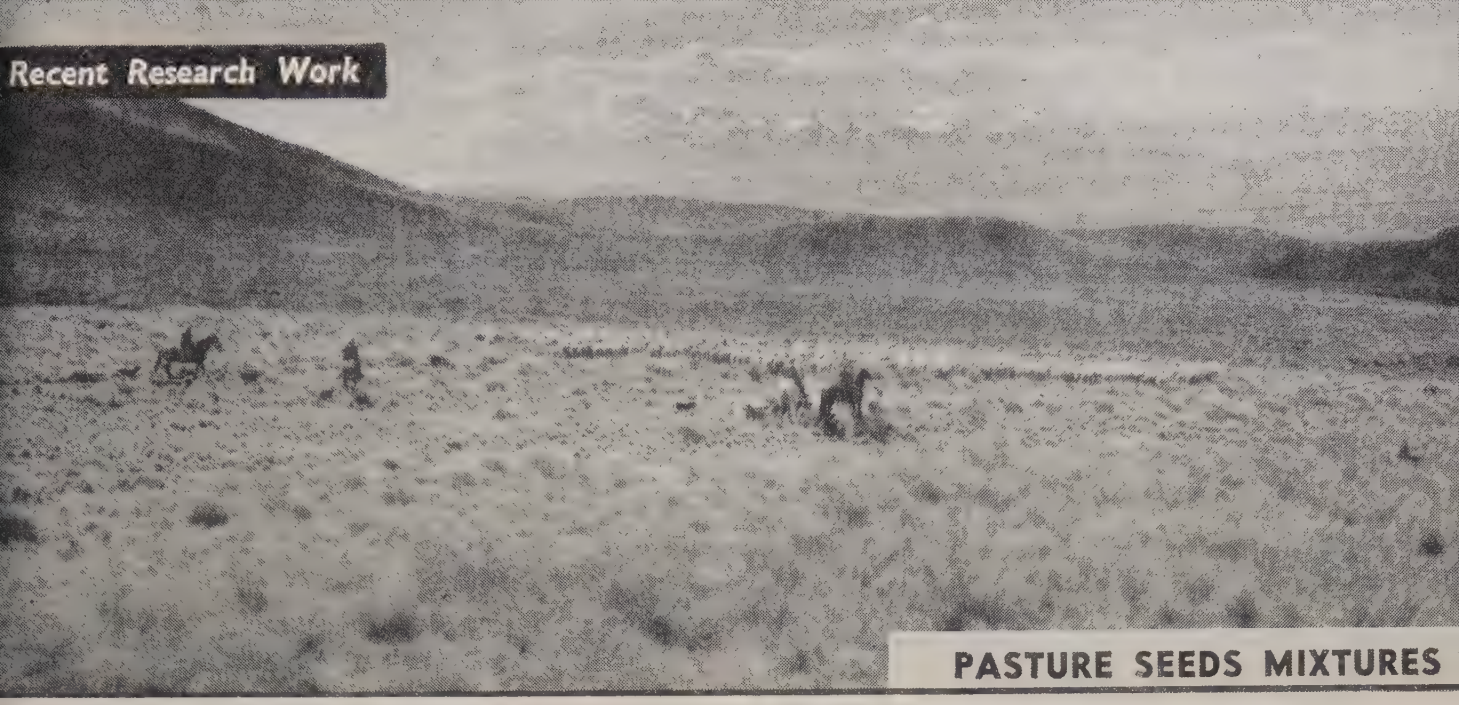
Testing and servicing by independent servicemen.

Testing and servicing by a farmer-organised co-operative scheme, through dairy factories, or through local farmer organisations.

Testing and servicing by milking-machine companies.

A trial scheme has been run in two districts in which Dairy Instructors of the Department of Agriculture carried out the testing and repairs were made by commercial firms. Results suggest that such a scheme could be of considerable value, and most of the farmers concerned have been very pleased with the results.

The Farm Dairy Instruction service of the Dairy Division has extended the scheme to a further 10 districts in the current season.



PASTURE SEEDS MIXTURES

A GREAT DEAL of experimental work has been carried out by the Extension Division of the Department of Agriculture to determine suitable seeds mixtures for soils which are too dry or too wet or too low in fertility for standard mixtures.

PHALARIS TUBEROSA

On some of the light soils of central Hawkes Bay subject to low rainfall and severe drying out and dying off of grass species such as perennial ryegrass and cocksfoot during occasional drought seasons *Phalaris tuberosa* has been under trial for several seasons. The trials have shown that *Phalaris tuberosa* can be established well from seedings of 4 to 5lb. per acre with or without subterranean clover and white clover, but the land must be surface cultivated or ploughed and the seed-bed consolidated to give a satisfactory strike. Sown as part of a mixture with other grasses, particularly perennial ryegrass, *Phalaris tuberosa* is very slow in establishing and pure sowings are recommended. The grass is very palatable, is drought resistant, and stands up to severe grazing. There appears to be a place for it in the improvement of much of the drier soils in central Hawkes Bay.

—R. P. HILL

* * * *

CANTERBURY LIGHT LANDS

A considerable amount of information has been gathered recently on pasture seed mixtures for Canterbury light lands. It is now generally agreed that the standard mixture of perennial ryegrass and white clover is not really satisfactory, and although subterranean clover has played an important part in the development of light land, it provides very little grazing during the dry summer. Perennial ryegrass fails to persist for more than 2 or 3 years and by the third year low-producing species such as hairgrass and sweet vernal are very conspicuous in the sward. When this occurs the pasture should be hustled or skim ploughed in early autumn, worked and rolled, and then sown with 1 bushel of perennial ryegrass and 1cwt. of phosphatic fertiliser per acre. If quick feed is required, 1 bushel of Algerian oats or Cape barley may be sown with the ryegrass.

The cultivation and fertiliser promote subterranean clover growth, the cereal gives early-winter feeding, and the reintroduction of perennial ryegrass ensures a well-balanced pasture for another few years at a comparatively low cost.

COCKSFOOT

The grazing management of cocksfoot is now better understood by farmers, with the result that this grass is now being included in many light-land mixtures. The following seeding rates per acre have given excellent results: Perennial ryegrass 10lb., cocksfoot 8lb., subterranean clover 3lb., and white clover 2lb. Areas sown in this mixture should be lightly stocked until the cocksfoot plants are well established, but after the first season no great management difficulties occur. Fields sown with this mixture 10 years ago are still producing very well and have excellent swards.

LUCERNE AND COCKSFOOT

Straight lucerne or lucerne-cocksfoot mixtures are now widely grown in North Canterbury. In many cases these areas are designed primarily for grazing, though an early cut of hay is usually harvested. Subterranean clover-ryegrass paddocks provide early feed, but when the standard mixture fails to meet stock requirements later in the season the lucerne or lucerne-cocksfoot areas, after a hay cut, are at an ideal stage for grazing. With the lucerne-cocksfoot mixture both rate of seeding and grazing management are extremely important. If too much cocksfoot is sown, the lucerne is crowded out. The rate of seeding recommended is 12lb. of lucerne and 2 to 3lb. of cocksfoot. Successful stands have been established with much less than 12lb. of lucerne, but light sowings are likely to result in thin stands unless ideal conditions are experienced at establishment. Grazing management should aim at a closely grazed sward in early August, as this appears to suppress cocksfoot growth and permit lucerne to come away more rapidly in spring. Neither cocksfoot nor lucerne will thrive under continuous grazing, and whether sown together or alone they must be allowed to recover after each grazing.

—E. G. SMITH

* * * *

TUSSOCK GRASSLAND

Plant-introduction trials have been carried out in the upper Waimakariri basin, Mackenzie County, and Central Otago. Of the various species tried recently several are giving promising results and as soon as seed is available will be tried on a larger scale. A trial in Mackenzie County in which various methods of sowing were tried shows very clearly that surface sowing on a tussock sward is not nearly as successful as where the seed has been drilled in. An improved type of point for spring-coulter drills has been devised for drilling seed into existing swards, and experiments have proved it very efficient on easy country.

SPELLING TUSSOCK GRASSLAND

Studies of the effects of spelling, by comparison of grazed and ungrazed plots, show that on fescue tussock grassland with mainly native species present improvement in the vegetative cover through spelling is extremely slow. Only slight differences are apparent between grazed plots and plots ungrazed for 5 seasons. However, in areas where introduced species such as browntop (*Agrostis tenuis*) and sweet vernal (*Anthoscanthis odoratum*) are common, spelling for up to 2 years has given marked improvement through the growth of introduced species.

—S. H. SAXBY

HEADING PHOTOGRAPH: Tussock grassland, Mackenzie Plains. National Publicity Studios photo.

Establishing Pampas Grass in Westland

PAMPAS grass has been grown in New Zealand as a fodder crop for a number of years. Although it has been used for this purpose mainly in the North Island, it can also be grown quite successfully in the South Island, and on the west coast it has a place in the farming economy. From observation of the many areas that have been planted in pampas grass enough information has been obtained for general recommendations to be made, and in this article J. R. Shepherd, Fields Instructor, Department of Agriculture, Greymouth, advises on establishment methods.

IT is important that the site on which the pampas grass is to be planted should be carefully chosen, as it has a direct relationship to the utilisation of fodder produced. Easy access to run-off paddocks and suitable soil conditions are desirable. The ground should be of medium to high fertility, easily cultivated, and reasonably well drained. Steep, broken country and areas infested with gorse and blackberry or which are permanently wet are unsuitable, and their use has been responsible for many failures in the past, as pampas grass, like other crops, will establish and yield successfully only when the soil fertility and treatment are suitable.

Cultivation

Preparatory cultivation should be concentrated on raising the soil fertility and suppressing weed growth with the object of producing a seedbed of good tilth. The area selected should be limed, if necessary, in April or May, and during June or July ploughed to a depth of 6in. with a mouldboard plough. Immediately ploughing is finished the furrow should be rolled flat to exclude air pockets and promote the decomposition of the turf. As a safeguard against a break in the weather it is advisable to roll each day's ploughing before finishing at night. In spring the area should be worked down by either discs or tine harrows, according to soil type, and sown with a smother crop of oats at 4 bushels per acre or a mixture of 2 bushels of oats and 1½ bushels of ryegrass per acre. This heavy sowing rate will deter prolific weed growth, and the trampling by stock when the crop is fed off will also materially assist in suppressing weeds. This green crop is grazed until just after Christmas, when, following the removal of stock to allow a recovery of growth of, say, 4in., the area is ploughed again to a depth of 4in. and worked down for planting. In districts where ploughing is out of the question topworking should be employed, incorporating as far as is practicable the methods outlined above, the object being to build up the fertility level of the soil and suppress weed growth as much as possible.

Suitable Plants

Either well-rooted 2-year-old plants, produced from cuttings, or seedlings may be used. Although seedlings are suitable, their small size may necessitate their being set out in rows in a well-sheltered fertile position for transplanting later.

Treatment in the Nursery

In the nursery plants should be placed 6in. apart with 18in. between rows to allow for intercultivation. At these distances 1/40 acre will accommodate sufficient plants for planting out later in 1 acre. Seedlings should be kept in the nursery for from 6 to 12 months, according to climate, soil conditions, cultivation, and manurial treatment, but with adequate care 6 months is generally sufficient. The home garden makes an ideal nursery, and provided the hoe is kept going to suppress weed growth and a little blood and bone is worked in along the rows, seedlings should produce vigorous, healthy plants suitable for transplanting.

Time and Methods of Planting

Planting may be carried out in either autumn or spring, except in inland districts subject to severe frosts, where spring planting only is advisable.

When cultivation is completed and a satisfactory tilth has been obtained marks at 7ft. 6in. to 8ft. intervals are drawn along and across the area to be planted, a 9ft. headland being left round it. At the intersections of these marks holes approximately 9in. deep and 9in. in diameter are dug for the plants. Well-rotted cow manure, compost, or blood and bone should be placed in the bottom of the holes and covered with a layer of soil. Plants raised in the nursery should have the top growth removed about 12in. from the ground to assist them to re-establish and to facilitate handling.

Care in Handling Roots

It is important to ensure that the roots are damaged as little as possible and any that are damaged should be cut back to sound tissue with a sharp instrument. In planting, it is necessary to ensure that the roots are well teased out and that they radiate evenly from the plant to the wall of the hole. After the plant is inserted the hole is filled in and the soil consolidated by thorough trampling.

Subsequent Cultivation

Intercultivation is advisable for the first 12 months to suppress weed competition and to promote the rapid growth of healthy plants. The spacing recommended allows sufficient room for working with implements until the plants are well established. Crops such as potatoes, carrots, or swedes can be grown with the pampas grass for the dual purpose of utilising the spare ground and assisting the grass when they are cultivated and manured.

Where sheep are carried on the property, cultivation, except for hand hoeing immediately round the plants during the first year, can be avoided by grassing down the area at the time of planting, the sheep being used to control growth without harming the pampas grass. Whatever method of weed control is adopted, it must be remembered that the ultimate productive value of the stand is determined by the treatment received in the early stages.

Grazing

As pampas grass should not be allowed to flower, the flower heads should be removed during February-March. At this time cattle will eat the flower stalks first in preference to the rest of the plant. The time of the first grazing is determined by the growth made by the plants. Under good conditions pampas grass is ready for the first grazing about 18 months from the time of planting. Where conditions are less favourable it may be necessary to delay grazing until 2 or possibly 3 years after planting. Methods of feeding off will vary according to circumstances, but the ideal is to feed off in breaks. This reduces wastage to a minimum and also keeps the herbage much fresher than where stock are allowed to roam over the area. If hand feeding is adopted, the easiest method is by placing a rope sling round the plant at the desired height, drawing it tight, and cutting the leaves with a hand-saw. This leaves a handy bundle for carting out. Plantations under 3 years of age should only be grazed once in 12 months while those over 3 years may be fed off twice yearly, say, at 6-month intervals.

Fertilisers

No information is available about manurial requirements, but there is every reason to expect a response from nitrogen, and the amount supplied in the soil by the encouragement of a good stand of clover when grassing down is done between plants would probably be sufficient; therefore, the normal application of lime and superphosphate to the grasses and clovers is all that is necessary.

Utilisation

The main value of pampas grass on New Zealand dairy farms is as a winter maintenance ration or as a general reserve of fodder during any famine that may occur. In feeding value pampas grass is similar to average-quality hay and should be fed under similar conditions. On the west coast of the South Island the main value of pampas grass is in limiting the necessity to save hay and in allowing surplus grass to be converted to silage.

Pampas grass provides excellent shelter by cutting off ground draught, a weakness in many shelter belts, and even if grown for this purpose alone, it can be used as a reserve fodder if necessary.

Maximum Return from All Hives

Seasonal Notes for the Domestic Beekeeper

SOME important points in the preparation of hive equipment and methods to make the best use of medium-strength hives which have failed to build up sufficient strength in time to take full advantage of the main honey flow as single units are discussed in this article contributed by the Horticulture Division.

ONE of the important things to decide about beekeeping equipment is whether or not there is a surplus of frames and boxes ready for use in the event of an unexpectedly good crop of honey. Extra supers can be of considerable value when the main flow begins. Every year in some part of New Zealand large quantities of honey are lost through lack of sufficient material to handle the main nectar flow. A ready supply of frames fitted with comb foundation should be available for replacements where drone comb has become excessive or where old combs have become pollen clogged, and to supply hives that are strong, especially where the bees are clustering outside with nothing to do. If these bees can be induced to draw out comb, it will help to reduce swarming. There is also a period when honey is being harvested during which bees are sometimes cramped for room until extracted combs and supers are returned to the hives. Some spare supers and combs are also desirable for making up nucleus hives or for housing swarms and for switching brood from one box to another where necessary.

Wiring and Embedding Foundation

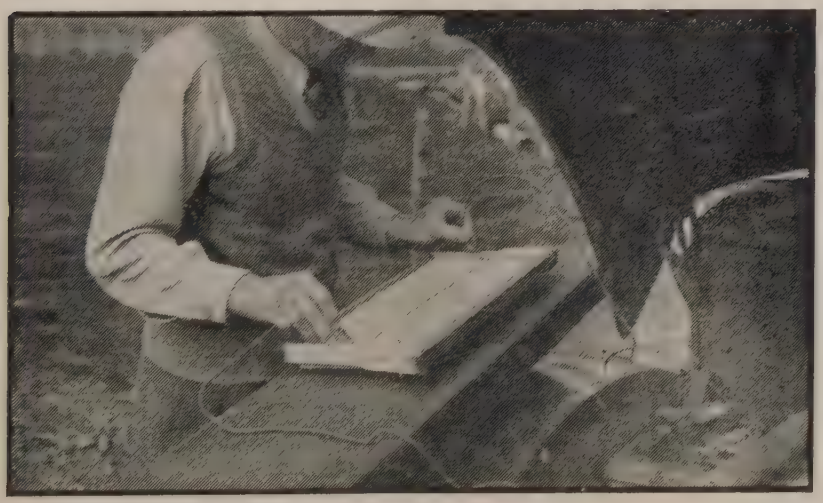
To those newly interested in bees the wiring of frames and embedding of comb foundation may be a problem. If this work is not done properly combs will collapse later when used by the bees. The end bars of the frames should be of dry timber so that when wiring is finished it will keep its tension. The electric embedding of foundation is done by a variety of gadgets built for the purpose, but they all involve the short circuit of electricity along one or all the wires, so that where contact is made the wax begins to melt. It is at this instant that the circuit must be broken; the wax then solidifies on the wire. This gives the necessary reinforcing that will help the foundation to carry the weight of bees and honey later. Two sources of electric power are fairly commonly used. One is a transformer, which is plugged into the ordinary wall socket; the other is a car battery to the terminals of which wires are connected by battery clips and are extended to a nearby table, bench, or plank. Embedding work may be done adjacent to the car without removal of the battery. (See the illustration below.) If the heating of the wire takes 2 or 3 seconds, it allows the operator the necessary time to give the operation a good "finish".

Full Use of Hives and Equipment

Much honey is lost each year, particularly in domestic apiaries where the beekeeper allows a number of hives which are below normal strength to continue in that condition as separate units until it is too late in the season for the bees to build up and store a good surplus crop of honey from the main flow.

A good plan to obtain the maximum return from all hives in the apiary is to make up a number of nuclei from half of the medium-strength hives at the beginning of the main honey flow by taking away the queen and one or two combs of brood with adhering bees. These should be placed where they can be cared for and later requeened ready for the following season's work.

The remaining portion of the medium-strength hives, all combs, brood, and bees should then be united by the paper method to the balance of medium-strength hives in the apiary.



Using electric power from a car battery for embedding comb foundation.

When the queen has been removed in the manner described the remaining combs of brood in each hive should be drawn together to form a compact brood nest and the outside spaces filled with good worker bee combs. Next, the complete brood nest, queen, and all the bees of the nearest medium-strength colony should be taken and placed on top of the prepared queenless hive, with a single or double sheet of ordinary newspaper between the two sets of bees. This work is best done late in the day when the weather is good and there is a honey flow. The bees in both hives placed together in this way quickly gnaw through the paper and unite peacefully. It is best not to disturb the united hives for a few days—until the bees have settled down to work and the queen has had a chance to survey her new surroundings. After that the brood combs may be adjusted and honey supers added as required

Use of Nuclei

Nucleus colonies, which are made up after the beginning of the main honey flow, cannot be expected to store a surplus of honey that year, but they will build up and store sufficient honey to carry them over to the next season and they may be used to bring the apiary back to full strength for surplus honey production, if they are requeened. Where the domestic beekeeper has little time to devote to queen-rearing, even on a small scale, the best plan is to purchase young laying queens of good quality from any reliable queen breeder and to get them introduced successfully before the close of the season, if the old queens are failing badly, or early the following spring, where the old queens appear capable of carrying on until then.

Watch for Foul-brood

Every beekeeper should be continually on the alert for foul-brood. A thorough examination of all brood combs should be made before attempting to divide or unite hives for any purpose. Any apparent irregularity in the brood of a hive should be investigated immediately. The cappings of healthy brood may vary in colour from light straw to a dark brown, but in all cases the cappings are built over the cells in more or less convex form and can be removed easily.

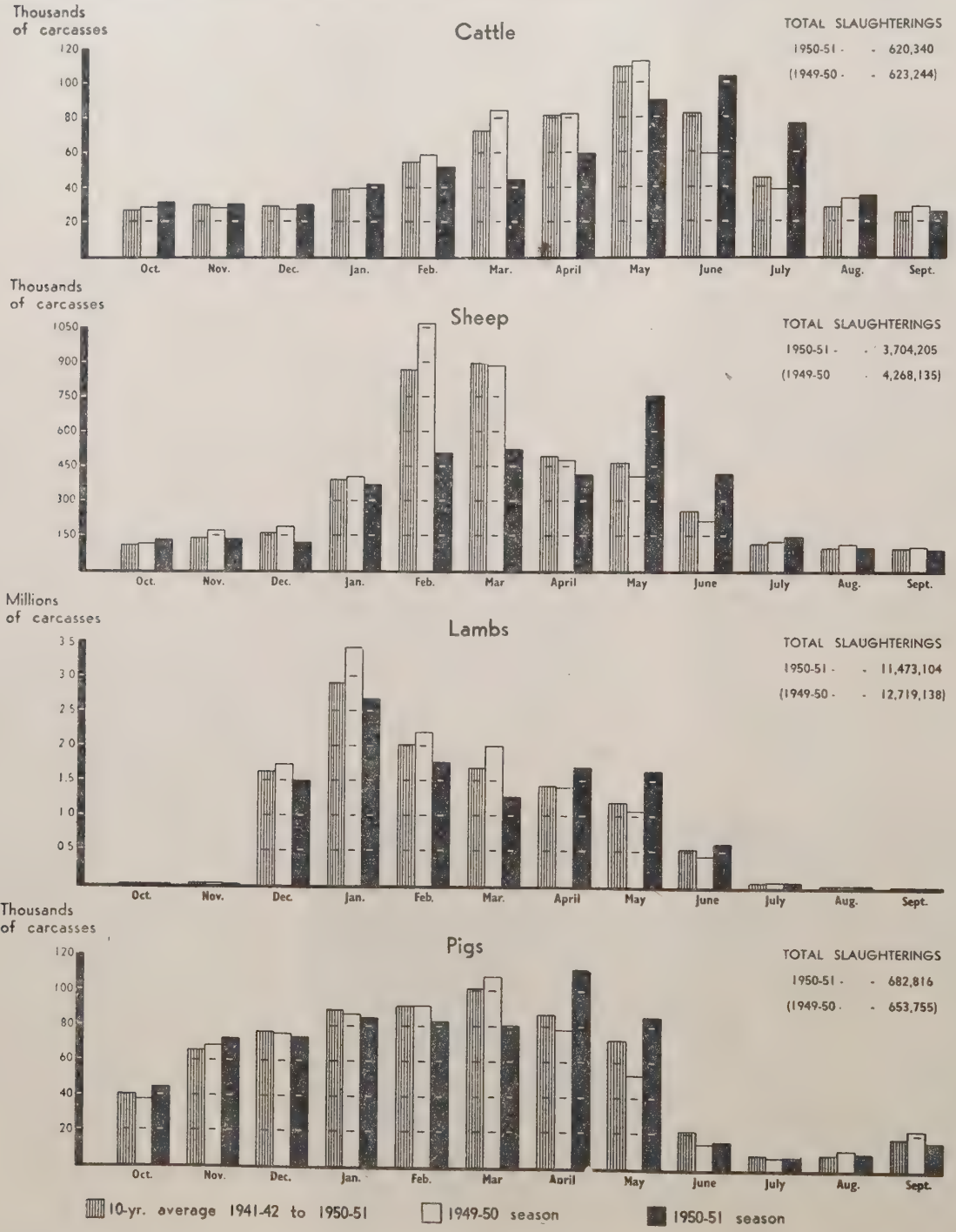
In the early stages of foul-brood, however, a capped cell here and there appears somewhat different from the surrounding healthy brood; it is dark, greasy in appearance, sunken, and in some instances slightly perforated. At this stage the most typical characteristic of the disease manifests itself. A simple test is to remove the cap from a diseased cell and probe the dead matter with a match stick, which should then be slowly withdrawn. If part of the contents of the cell adheres to the stick and is ropy in condition, it is conclusive evidence of the disease. Where there is any doubt as to the cause of dead brood beekeepers should forward specimens immediately to the Apiary Instructor for the district for examination. Where foul-brood is present the contents of the hive, including the bees and bee combs, should be destroyed at once and the remaining hive equipment sterilised thoroughly.

PRIMARY PRODUCTION REVIEW

From data supplied by the Statistical Section, Extension Division, Department of Agriculture, Wellington.

Livestock Slaughtered at Meat Export Works and Abattoirs

The diagrams below show clearly the reduction and delay in the slaughtering of the main classes of stock during 1950-51.



Electric Top-heat Wax Cappings Melter

THE redesigning of cappings melters for the recovery of honey and beeswax from comb cappings has greatly improved their efficiency. The basic principles of cappings melters should be: First, controlled heat; second, adequate insulation; and third, a quick getaway for the honey. A design of melter which has given fairly satisfactory service to beekeepers is described in this article by L. H. Johnson, Apiary Instructor, Department of Agriculture, Palmerston North.

THE electric top-heat melter is reasonably economical to construct. For the appliance described a design embodying a simple form of construction has been chosen rather than the design of streamlined, factory-made equipment. The average beekeeper who has some knowledge of wood and sheet-metal work could make a top-heat melter in his workshop. Precision measurements are not required, but it is important that the bottom of the screen basket should not be more than 9in. from the heating element, as it is designed to work at a comparatively low temperature. The melter will hold the cappings accumulating from 1 ton of extracted honey.

Details of Construction

First make the inside tank of 24-gauge sheet metal to the dimensions (as indicated on both the end and longitudinal sections in the diagrams below) 5ft. x 2ft. x 1ft. 6in. deep at the outlet end and 16in. at the rear.

The bottom of the tank has a slope of 2in. from back to front and 1in. from sides to centre to take all the drainage to the outlet. Three sockets or brackets should be riveted and soldered to the end walls of the tank 10in. down from the top. These will support the ends of 3 lengths of 1in. water pipe which in turn will carry 2 wire-mesh baskets. The pipes should be loose fitting to facilitate easy removal for cleaning.

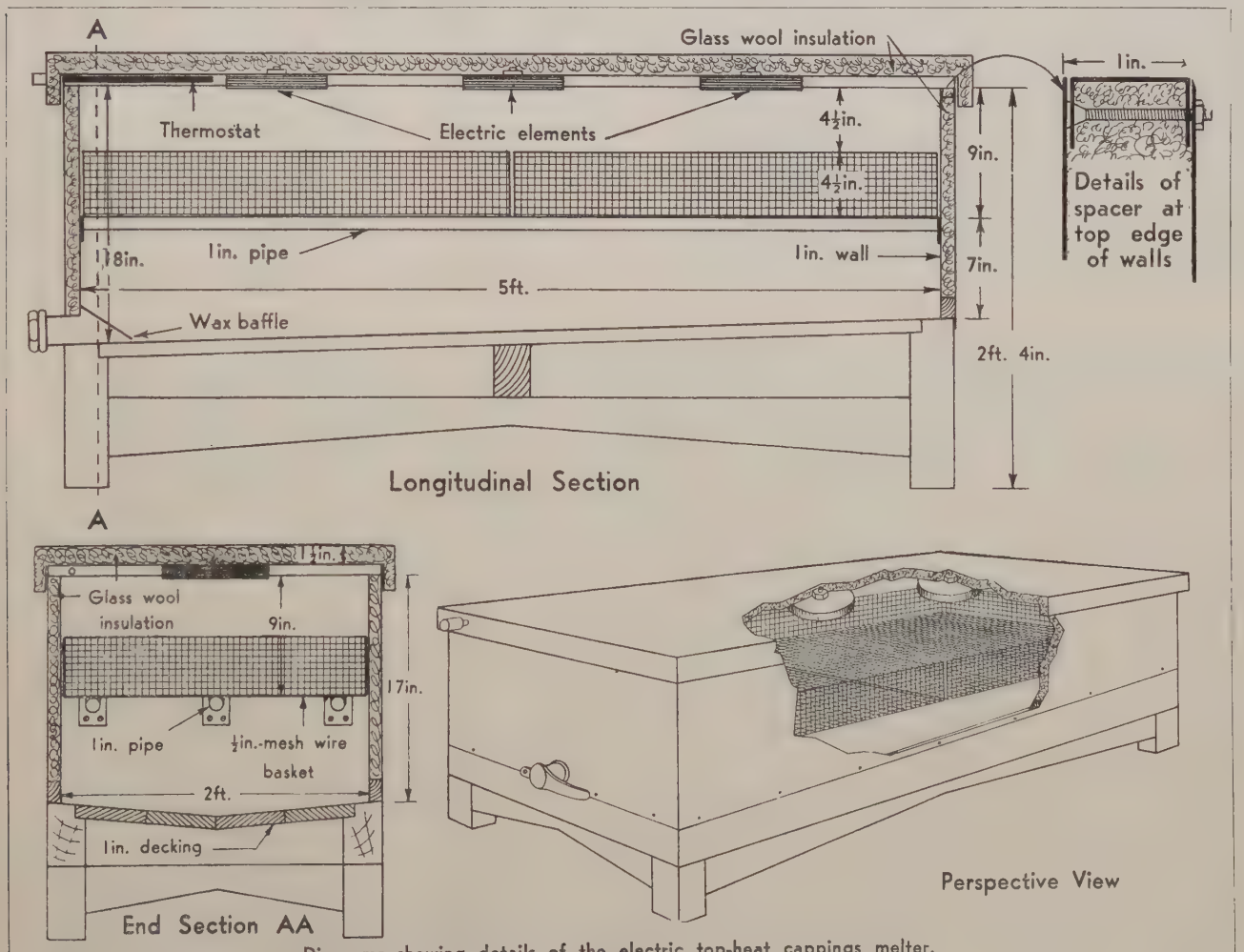
Wire-mesh Baskets

Wire-mesh baskets may be made from 16- to 12-gauge galvanised wire wove with $\frac{3}{8}$in. or $\frac{1}{2}$in. meshes. The heavy wire will make a rigid basket which will not require strengthening. The basket is made in two sections for easier handling for cleaning. Each section has one end and two sides turned up $4\frac{1}{2}$in., which is half the depth from the top of the tank to the top of the supporting pipes. A space of $\frac{1}{4}$in. should be left between the basket and the tank.

Insulated Side Walls

The outside walls of the tank (which may be four separate pieces) should be of 24-gauge or heavier sheet metal. To keep the top edges correctly spaced a strip of metal is shaped like a channel iron 1in. wide and fitted between the walls. Metal thread screws may be used to bind the walls to the spacer and finally the top edge joints should be soldered. The double-walled tank is then turned upside down and the wall space packed with glass wool insulation. As there is no heat below, strips of 2in. x 1in. timber may be used as spacers at the bottom edges of the walls. To prevent the wax from clogging the honey gate a baffle plate should be placed in position with a space of $\frac{1}{4}$in. under it to allow honey to escape.

A standard 2in. honey gate will complete the tank. The underside of the tank is not insulated. To carry the tank at a convenient height a stand may be built of 4in. x 2in. timber with



Diagrams showing details of the electric top-heat cappings melter.

1in. decking shaped like the bottom of the tank. A wooden frame with a cross-piece the dimensions of the top of the tank should also be made for use when uncapping combs.

Insulated Lid and Heat Elements

The lid should be of 24- or 22-gauge sheet metal. To prevent the escape of heat there should not be any metal connections other than at the outer edges between the inner and outer sheets of the lid. Thin gauge sheet metal will sag in the middle, but strips of light angle iron may be used as bridging or ribs by riveting them on to the inside surfaces of both the upper and lower parts of the lid. The space in the lid (1½in.) should be packed with glass wool. The upper and lower sections of the lid should be screwed together so that it can be dismantled, if necessary, to give attention to the electric wiring concealed within. By fixing a strip of angle iron to the vertical outer margin of the lid it may be raised ⅝in. above the top edges of the tank.

Electric Heating Elements

A closed 6in. plate element as fitted to the top of an electric range is a suitable heating element. Each double element should be wired in series to reduce the wattage to 800 or as low as 500. A fierce heat that will blacken the melter should not be used. Three elements will give fairly good distribution of heat.

Control of temperature is important. There are many types of thermostats on the market which may be suitable; one that has been used with the design is a hot-water thermostat with the outer shell removed. If the lid is raised ⅝in. above the top of the tank, the thermostat may be fixed under the lid but with the control indicator on the outside. The electric elements and thermostat can then be connected up. A qualified electrician only should undertake this work.

An alternative for heating is to use two 4ft. 6in. tubular electric elements, which when fixed to the lid at about 1ft. spacings should give a good distribution of moderate heat. As the tubes are twice as thick as the plate elements, an extra 1½in. in depth to the bottom of the baskets should be allowed. It would be necessary to have the flow of electric current controlled by a thermostat. The lid is fairly heavy to handle, but may be hinged to one side of the tank or hoisted to the ceiling with blocks and tackle.

Working Principle

When using the melter it is necessary first to open the lid and spread a double thickness of scrim or cheese cloth over the wire baskets, tucking the top edges tightly in the ¼in. space between the wire mesh and the side walls. Slumgum is thus prevented from getting into the wire mesh, from which it would be difficult to remove. With the wooden frame placed in position combs may be uncapped into the melter, from which honey will drain and run through the open gate as work proceeds. When the melter is filled the wooden frame may be removed and the lid closed. The heat should be switched on with the thermostat set at 200 degrees F. Honey will continue to run cold from the gate; over-heating cannot occur. The top ½in. of cappings will continue to collapse and melt and the honey will escape downward.

As the mass of cappings gradually subsides liquid wax will also make its way down through the screen into the cold compartment below, where it will solidify. All slumgum is retained on the scrim. It takes about 8 hours to dispose of the cappings and it is usual to leave the melter to work overnight. As considerable evaporation takes place with top heat, the space below the elements is kept moist and steamy. The fire-proof lid, the closed elements with a maximum moderate heat, thermostatic control, and the moisture all combine to eliminate fire hazard.

After the honey has ceased to run the power should be switched off and the lid raised. The scrim containing the slumgum should be lifted up and the refuse shaken out while it is hot. For final cleansing the fabric should be immersed in a tin of hot water and hung out to dry before being used again. Baskets and supporting pipes should be removed and the wax then lifted out in pieces. Later it can be remelted and run into moulds. The insides of the melter and baskets should be washed well with hot water before the melter is used again. If the equipment is used repeatedly without being properly cleaned the film of honey on the walls, especially near the top, will gradually bake on and become very difficult to remove.

As the melter operates with a moderate, controlled heat, it should remain bright and clean.

This melter will not recover the wax in a finished condition, that is, in a moulded block, but 98 per cent. of the honey collected will be first class, which is the major consideration. Cappings from combs of all types of honey can be put through very satisfactorily, but manuka honey, because of its thixotrophy (tendency to jelly) is slow to move even when fairly warm. Though the melter will deal with manuka honey cappings in time, it is preferable to use a press if there is a quantity to be melted.

Government-approved Turnip and Swede Seed

THE threat of shortages in New Zealand's supplies from the United Kingdom led to the beginning in 1940 of the production of New Zealand-grown Government-approved seed of a range of turnip and swede varieties. Since that time virtually all New Zealand's supplies of turnip and swede seed have been grown locally, most of it under the direct supervision of, and raised from selections made by, officers of the Department of Agriculture. This seed is marketed throughout New Zealand in 1lb. and 2lb. bags as "Government Approved".

The Department has carried out many trials in the past 10 years to compare Government-approved seed with imported seed, and farmers who have had an opportunity to inspect these trials have been impressed by the high quality which has been attained in the locally grown seed.

Trial in Southland

Not the least significant of these trials were some comprising a series carried out on 20 farms in Southland last season. In this series the farmers concerned had been able to obtain some seed from England for their own use, and the Department arranged that Government-approved seed of similar type should also be sown by these farmers as a basis of comparison. The farmers had made special efforts to obtain imported seed and presumably favoured such seed to the locally grown Government-approved seed.

Last winter a representative of the agriculture section of Federated Farmers and an officer of the Department of Agriculture were associated in an inspection of the areas. In two cases the seeds of different origins had been sown under different conditions, so that comparison was impossible. In all other cases it was observed that the locally grown seed produced a crop at least as good as that from imported seed. This was the opinion not only of those who inspected the areas, but of the farmers. Some expressed surprise at the quality of the crops produced from Government-approved seed; all were of the opinion that there was nothing to be gained from the use of imported seed.

Government-approved turnip and swede seed comes into the same category as certified seed—it is the produce of specially selected material, multiplied under departmental supervision and suitably identified. But for the fact that containers of certified seed carry the certification seal and tag, Government-approved turnip and swede seed would be identified as "Certified". The seed loses nothing in quality by not being so identified. Every step in its production is carefully supervised and individual lines are thoroughly blended to make one uniform line of each variety for distribution throughout New Zealand each year.

The bags of seed are sewn by a lock-stitch machine, which is as effective as sealing the end of the sewing twine, but the Department has viewed the addition of its own label and metal seal as an unwarranted expense. This is why the seed is described as "Government Approved" rather than "Certified"—not because of any doubt as to the quality of the seed.

Characteristics of a Good Type of Dairy Calf

TO assist young members of calf clubs who may have to judge calves or select them for entry at club shows points which may be helpful and the characteristics of a good-type dairy calf are outlined in this article by G. F. L. Hudson, Inspector of Stock, Department of Agriculture, Otaki.

A CALF should mature into a good dairy cow and therefore it should possess all the requirements necessary in an animal which must produce large quantities of milk season after season.

A first-class dairy cow is a complex machine whose job it is to turn large quantities of food into milk. It is exacting work and only a strong, well-constructed machine will stand up to it.

Some judgment will be necessary to determine how a calf will develop. In a good dairy type of calf the following points should be noticeable.

General Appearance

Constitution: Indicated by apparent health, size (that is, the animal should be well developed according to its age), bone formation, strength, and activity.

Form: The ideal dairy cow should appear wedge shaped when viewed from the front and side, and though the calf may not always show this desirable shape, there should be evidence that this will develop with maturity.

Quality: Denoted by the hair, which should be fine, and the skin, which should be soft and pliable and of medium thickness when a fold of it is felt between the fingers.

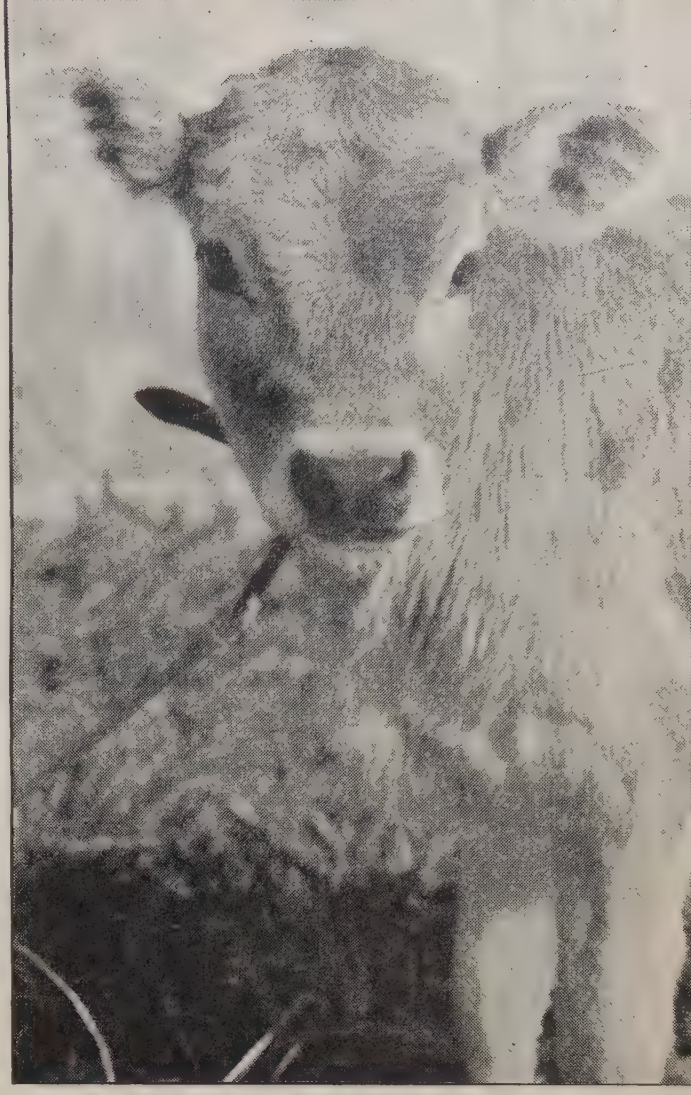
Temperament: The animal should be active and tractable —that is, it should be easy to handle, especially among a crowd of people or in traffic—alert, and the eyes bright. The skittish, too nervous animal is seldom of much use.

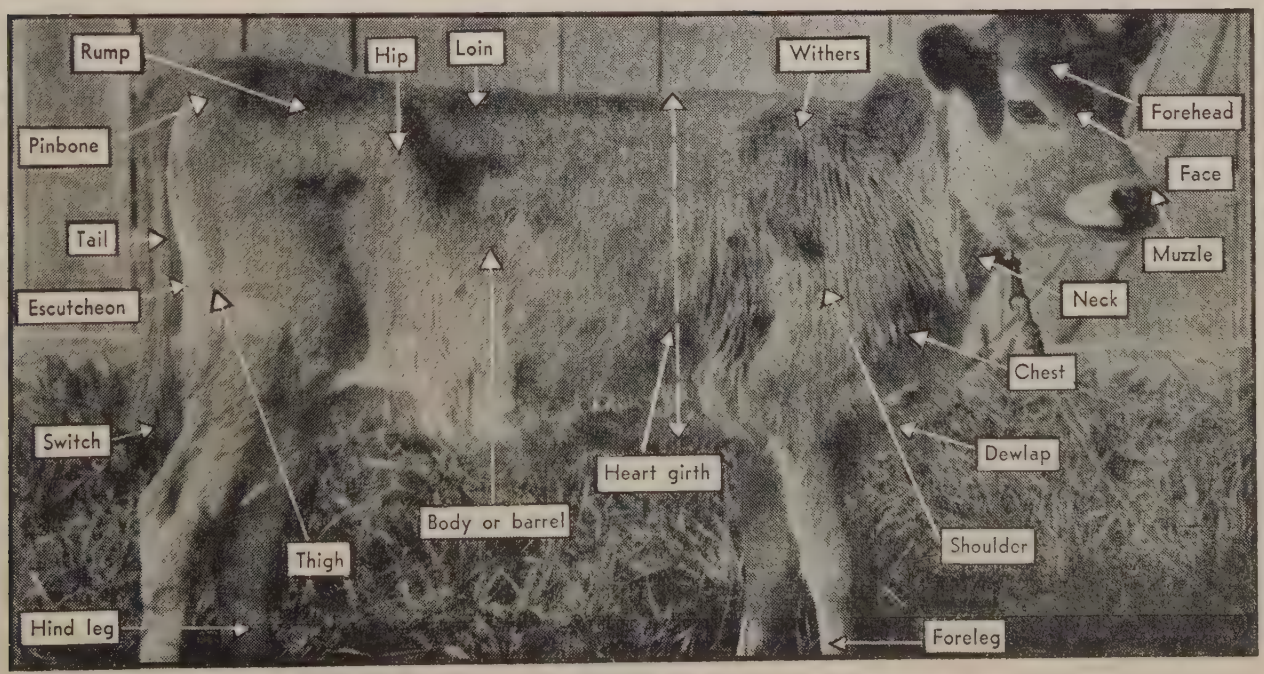
Parts of the Body

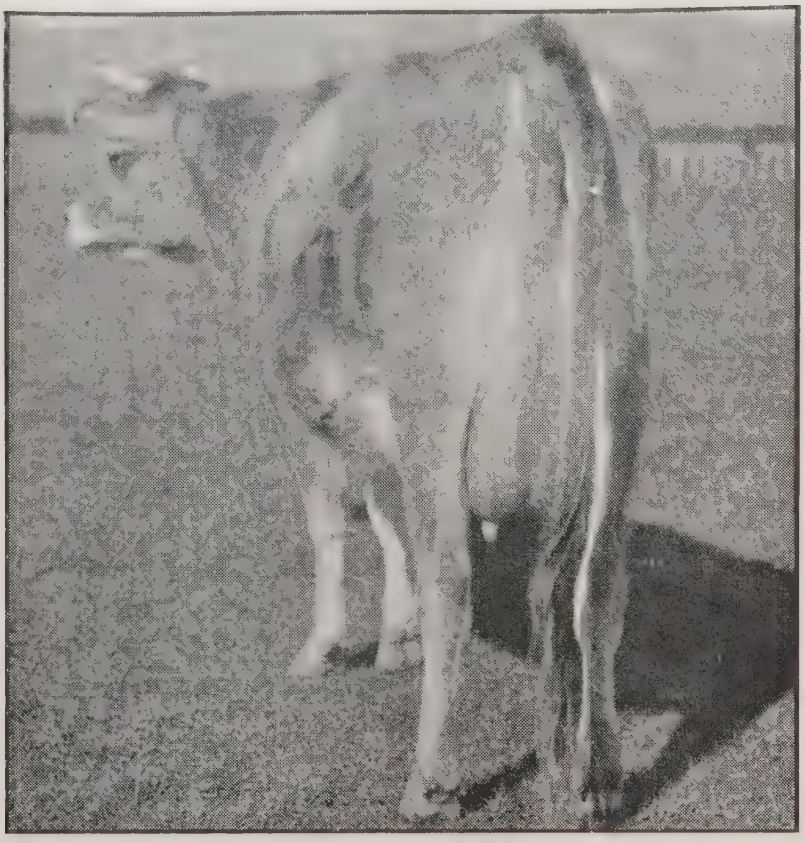
1. The Head, Neck, and Throat

Forehead: Broad and full, making the eyes well spaced and giving character to the head.

Eyes: Large and prominent, bright, calm, and placid, denoting a gentle disposition. The brightness of the eyes







A calf's legs straight and wide apart indicate room for development of the long, square udder, attached well forward and hung high behind, so necessary in the high-producing cow.

A consistently high producer with all the desirable conformation characteristics.

is largely a sign of good health, just as dull eyes usually denote bad health.

Face: Lean, not short, and slightly dished.

Muzzle: Broad, clean, and strong; the nostrils should be large, and also the mouth. The lower jaw should not recede or be "undershot"; the teeth should be squarely on the pad of the upper jaw.

Ears: Medium in size and fine in texture. (This characteristic is well shown in the illustration at the top of page 451).

Neck: Fairly long and thin and merging smoothly into the shoulders. Throat: Fine and clear, making a smooth line from under the jaw to the neck. Dewlap: Fine, free of heaviness or coarseness.

2. Fore Part

Chest and brisket: Broad and showing strength, but not too fleshy or coarse.

Withers: Well defined and lean. Shoulders: Light and not too fleshy.

Legs: Straight, when viewed from front and side, and wide apart to allow for a large heart and lungs; not too long, rather short for preference, and square under the animal. Hooves: Fine, not coarse.

3. Body

Back: Straight and level from shoulders to root of tail. The backbone well defined and open jointed; each vertebra should be clearly felt when the fingers are run along the spine.

Body or barrel: Long and deep, allowing capacity for the large quantities of food necessary for an animal to give large supplies of milk. Ribs: Broad and flat, well sprung or arched, and well spaced.

Heart girth: Broad and deep, giving plenty of room for heart and lungs.

Loins: Broad and strong.

4. Hind Part

Hips: Prominent, wide apart, and level.

Rump: Long and level from hips to pinbone.

Tail: Well set on so as to continue the level top line. It must be long, fine, and tapering, with a good switch.

Thighs: Long and lean, flat inside and out.

Legs: Straight, rather short, and wide apart to provide room for a large udder.

Udder: Development is not well defined in a calf, but indications should be present of the long, square udder, attached well forward and hung high behind, so necessary in the high-producing cow. Teats: Square, evenly spaced, and prominent.

A summary giving the essential points of a first-class calf is as follows:—

The animal must be constitutionally strong, tractable, alert, and intelligent.

The head will denote the character of the animal.

The body should be long and deep and the mouth and nostrils large and strong.

For endurance, a strong heart and good lungs are required.

The bones must be strong and flat, not coarse or heavy.

FARMING IN NEW ZEALAND

THE farming pattern in Waitaki County, also known as North Otago, is reviewed in this, the concluding section of an article by A. H. Mouat, Assistant Field Economist, Department of Agriculture, Dunedin. The first section, published in last month's "Journal", traced the history of settlement in the area and described topography, climate, and soils.

WAITAKI County may be divided broadly into four regions into which the farming pattern falls—the high country, the foothills, the downs, and the plains.

High-country Sheep Runs

The area covered by high-country runs is about four-fifths of the county. Originally this area was settled between 1850 and 1860 in very large runs. For example, Benmore Station covered more than 300,000 acres and Omarama Station about 183,000 acres. Subdivision has reduced the size of runs considerably.

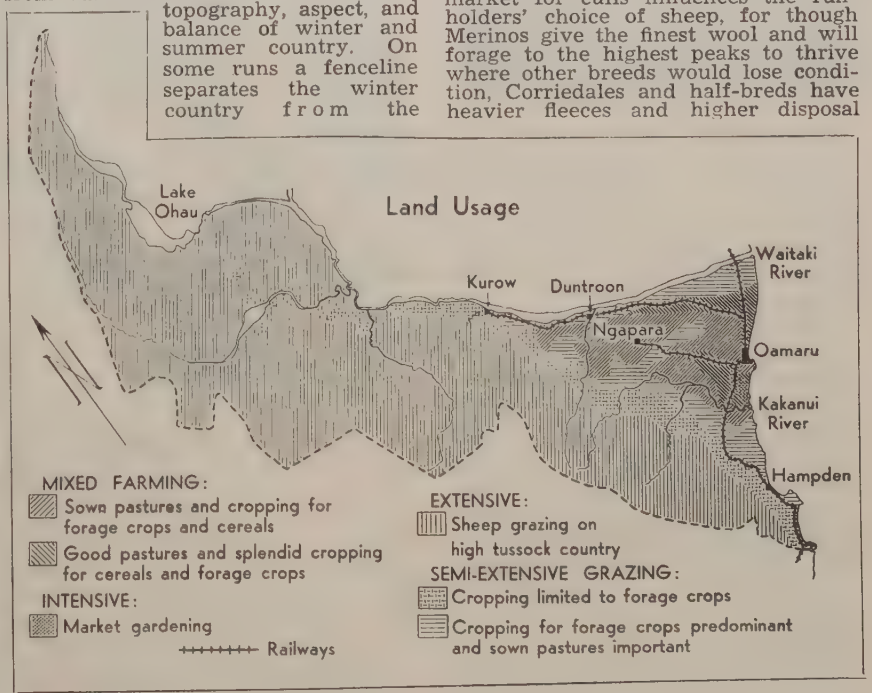
Many of the runs include a block of steep hills and ranges, some gentler slopes and flats, and a limited area of ploughable land. The economic value of a unit under this extensive method of sheep grazing can be measured by the relation between winter and summer country. The term "winter country" is applied to land that is reasonably free from snow risk in winter so that sheep can graze safely. "Summer country" refers to the heights, back faces, and valleys where heavy snow may fall, particularly in winter.

Much of the upper Waitaki Plain below Lake Ohau is dangerous because of snowdrifts, so wherever possible sheep are wintered on the surrounding hills. The situation is ideal where the balance between winter and summer country allows complete spelling of each area in the off seasons without overstocking of any part at any time. An area of river flat or ploughable land to provide lucerne hay and green-feed is most desirable for avoidance of hard grazing of early growth on the hills below the snowline.

Runs are commonly subdivided into blocks according to the nature of the land, its aspect, snow risk, and accessibility. In general the highest and most difficult country is stocked with dry Merino or half-bred sheep, which will climb and search for the hard feed on which they thrive; all the sheep are mustered off the highest country in May and held on the lower slopes until the first heavy snow has fallen, when they may be freed to climb to the snowline. The ewe block tends to be easier, more accessible country with a favourable aspect and shelter for the stock. The hogget block is usually a smaller one on country of good aspect, convenient to the homestead for observation and for feeding out in winter.

This arrangement of blocks varies from run to run in accordance with topography, aspect, and balance of winter and summer country. On some runs a fenceline separates the winter country from the summer heights and blocks are subdivided in the winter country for wethers, ewes, and hoggets. A number of runs, on the other hand, consist of all good ewe country and few wethers are carried; ewes and hoggets are wintered on the block which provides the best shelter and safety from snow, and can range over the remainder of the run at other seasons.

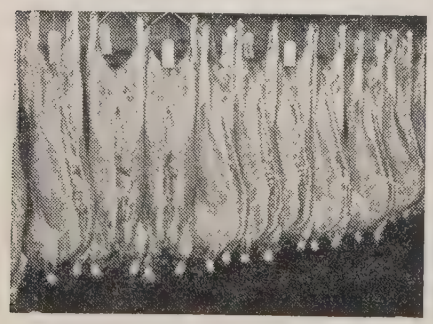
Of the 677,000 sheep in Waitaki County in 1949 about 270,000 were run on the high-country soils. The predominant breeds are fine half-breds (more than 100,000), Corriedales (about 60,000) and Merinos (about 80,000). Cull half-bred and Corriedale ewes are in demand by farmers on the low country for fat-lamb production. This market for culls influences the run-holders' choice of sheep, for though Merinos give the finest wool and will forage to the highest peaks to thrive where other breeds would lose condition, Corriedales and half-breds have heavier fleeces and higher disposal



DOUBLE TRIUMPH for

ELASTRATOR CASTRATION AND TAILING

at the Marlborough A. & P. Association, Picton.



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. . . to Mr. M. D. Campbell, Marlborough, enthusiastic Elastrator user for 4 seasons. He finds Elastrator rubber ring method easy, clean, safe . . . has operated on more than 1,200 lambs and lost only ONE. Says Elastrator gives first-class results . . . proves it with champion stock.

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. . . to Mr. T. P. Murphy of Spring Creek, another consistent Elastrator user who acclaims the advantages of this bloodless method of castration and tailing . . . and who shares in Elastrator's Double triumph.

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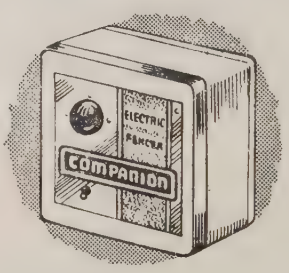

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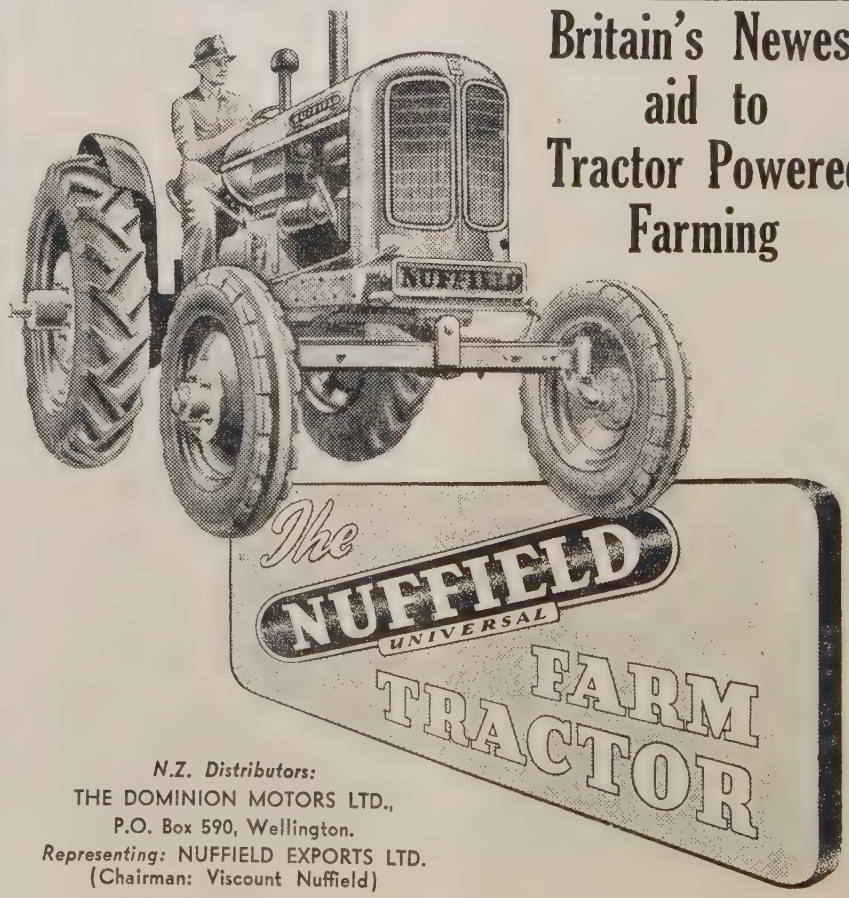

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[*J. U. Macaulay photo.*

In the central basins of Waitaki County some of the country is nearly as depleted as some areas of Central Otago. Scabweed is evident.

value. Rams are bought from a number of sources. Merino rams are brought in from Marlborough and Australia by a few owners, others obtaining their requirements within the county. Most half-bred and Corriedale rams are obtained from the leading flocks within the county or from the neighbouring Mackenzie Country.

Flock Management on High Country

Lambing takes place on high-country runs in October, when danger of heavy snowfalls is small and spring growth is just beginning. Before lambing the ewes move down on to lower slopes, and this facilitates the spring muster for marking of the lambs in November, after which the flock returns to the ewe block. Lambing percentages vary, but 70 per cent. is an average for many of the runs.

Dry sheep are usually shorn in November or December and the ewes in December or January. A few farmers dip the dry sheep after shearing them and before sending them on to the summer country. On some runs with favourable aspect and feed sheep have been shorn early before lambing with satisfactory results in recent mild years. Average fleece weights are 6½ to 7lb. for Merino ewes and 4½ to 5lb. for hoggets; half-bred and Corriedale fleeces vary, but tend to be a little heavier than Merino.

The flock is usually mustered for dipping in late February. The lambs are weaned and the sheep return to graze on the summer block. The May muster serves three main purposes—the high summer country is cleared before the early snow, ewes and rams are mated, and the flock is crutched and eye clipped. The rams are removed later in the winter. The dry sheep go on the wether block for the winter and the ewes on the ewe block of the best winter country. The hoggets may run with the ewes or on a separate hogget block fairly accessible for the feeding out of hay and chaff, which is becoming more widespread. Some runs have established stands of lucerne to keep the hoggets and rams in good condition through the winter. On properties which have private irrigation systems good pastures can be established for greenfeed and hay. Oats for chaff, rape, and turnips can be grown in favourable localities.

On many of the runs all the ewe lambs and some wether lambs are kept for flock replacements and few or no surplus lambs are sold. That is general on the highest stations in the county and on other runs having insufficient ewe country. Most other runs include good ewe country and have surplus lambs which find a ready market on other stations for flock replenishment. Some fat lambs are obtained in the upper Waitaki area on river flats where the feed is good; some runs send store lambs down country for fat-lamb producers. Ewes are usually culled when 5 or 6 years old and sent down country to fat-lamb breeders, though some go fat to the works. Similarly, wether culls may go away fat or be sent down for fattening.

Cattle are carried on a few of the runs and especially on those in the heavier-rainfall districts near the head of the county and on the Kakanui Range. The chief drawback to expansion of cattle raising is that the present fencing is not adequate for cattle.

Farming on the Foothills

The soils of the foothill region are mainly silt loams of the Kauru, Opuha-Kakahu, and Otekaieke series. The Claremont silt loam adjacent to the Opuha series is a downland soil, but these two soils will be considered together because farm practices are somewhat similar throughout.

Kauru and Related Soils

On the silt loam of Kauru and related soils of relatively high country with good rainfall sheep farming is carried on, with cultivation possible to an altitude of 1200ft. on some farms.

The characteristic difference between this type of sheep farming and that of the high country is the greater provision of supplementary feed crops of swedes, turnips, chou moellier, hay, greenfeed oats, and barley. Rape is grown to a limited extent for fattening lambs, mainly on the lower country. Lucerne is grown for hay and does well on the slopes. The period of crop rotation usually covers 3 years to clear the ground of browntop, to which sown pastures tend to revert after 5 or 6 years. Topdressing with lime and fertiliser is required to encourage the more palatable grass species. The practice is developing of applying lime before sowing the pasture mixture, which usually includes about 1½ bushels of perennial ryegrass, 2 to 3lb. of white clover, 5 to 10lb. of cocksfoot, and perhaps 2lb. of crested dogstail per acre.

Fine Romney crossbred, half-bred, Corriedale, and three-quarter-bred flocks are popular in this area. The type of ewe sent from the foothills in annual drafts is considered excellent for fat-lamb production on the downlands and flats. Sound 4-year-old ewes may last three more seasons on the easier country with reasonable care. Fat wethers go to the freezing works in autumn. The percentage of lambs from ewes varies with the season, but an average is between 70 and 80 per cent. Though nearly all the ewe lambs are retained for the flock, most of the remaining lambs are sent to better land for fattening. On the lower farms some fat lambs are produced.

Cattle run on the foothills are a fifth fewer than 20 years ago, but sheep numbers have increased by 60 per cent. since 1921-22. Calves and store cattle of the Black Poll-Hereford cross are sold off this country.

Claremont and Opuha Soils

Claremont and Opuha soils are intermediate between Kakahu and Oamaru soils in location, rainfall, and productiveness. Having shallower topsoils over heavy subsoils, they are perhaps not as naturally fertile as Oamaru soil or as suitable for wheat growing. Sheep management and the provision of sheep feed are important in farming programmes in this area. This is shown in the crop rotation: After cultivation a grass paddock may be sown to rape, turnips, or swedes; when wheat is grown it may follow either the rape crop or a fallow from pasture. Greenfeed oats are frequently grown later in the rotation, when they may be included as a cover crop when new pasture is sown down.

Most of this area was overcropped in the early days of settlement; sown pastures lasted only a short period, fertility fell, and browntop gained a hold. Efficient pasture management on these soils calls for periodical dressings of lime and fertiliser to improve the condition of the soil sufficently for browntop to be replaced by high-producing pastures of ryegrass, cocksfoot, dogstail, and clovers. A number of farmers have improved their land greatly in this way.

The Romney ram is generally preferred. Wool production is considered carefully and a good, even line of wool is obtained by selective breeding. Romney fleeces tend to be stronger in this area than on the hills, and the average weight of a ewe fleece is commonly 8 to 10lb. The best ewe lambs are selected as replacements and surplus lambs are fattened on rape or sold as good stores.

Winter feed includes turnips, swedes, hay, chaff, chou moellier, greenfeed oats, and young grass until the spring growth of pastures has begun.

Otekaieke Soil

In the early days of settlement the area on Otekaieke soil was included in the large pastoral runs, but since subdivision farming on this lower country has been more intensive. On parts of this district where the average annual rainfall is only 14 to 15in. the productivity of the soil is limited.

A crop rotation common in the past was: First rape, followed by wheat, oats, or barley (sometimes two of these cereals), then pasture. Some farmers, finding that summer grazing of rape left the land too dry for autumn-sown wheat, now grow wheat first after a summer fallow to conserve moisture. A crop of greenfeed (oats, barley, or ryecorn) or rape may follow before the new pasture is sown down, preferably without a cover crop. Pasture mixtures in this locality include 1¼ bushels of perennial ryegrass, 2lb. of white clover, 2lb. of Montgomery clover, and 4lb. of cocksfoot. Subterranean clover has been established with success by some farmers.

Yields of cereal crops vary considerably from season to season with variations of climate. In this low-rainfall area lucerne has proved the most dependable crop and forms the basis of the winter feeding programme. Some farmers near the rivers have parts of their holdings under irrigation, which ensures a good crop in the driest years.

Romney crossbred, half-bred, and Corriedale ewes are common on this lower country for crossing with Border Leicester, Southdown, and Romney rams. Some of the lambs may be drafted fat off their mothers, the rest going either on to rape for a few weeks or to down-country farms for fattening. Replacement ewes are usually obtained from the hill-country runs or from the ewe fairs in autumn. The tendency to increase the flock after wet seasons must be resisted or a dry season will find the property overstocked.

The arid climate healthy for stock is also excellent for ripening fruit. A narrow belt of richer land occurs along the base of the limestone and schist hills. The deep, friable soil, with good drainage and northerly aspect, is suitable for growing apples, apricots, peaches, nectarines, cherries, and raspberries. Though the area has not the name for fruit production that Central Otago enjoys, conditions appear similar in many respects. Frosts are seldom severe, as the cold air moves down on to the river flats. Stone fruit of excellent quality and yield has been produced on this belt without irrigation, and good road and rail communications assist the marketing of the produce. In 1949 commercial orchards in the county totalled 130 acres.

Farming on the Downs

Running from the vicinity of Otiake toward the coast, the downs of Waitaki County include the Timaru, Ngapara, Waireka, and Oamaru soils.

Timaru Soil

The arable mixed farming common to the area of Timaru soil provides the main part of its income from sheep; cereal cropping and sidelines such as dairy cows, poultry, and pigs also figure in the economy.

Arable farming is followed largely for the renewal of pastures which form the basis of farming in this region. Cropping practice on Timaru soil from the early days has shown that the natural fertility can be maintained at a high level if a good rotation is followed. The choice of a rotation is important and, apart from the soil, is conditioned by many circumstances such as the area of the farm, the capital equipment (including machinery), the stock carried, the amount and proportion of arable land, and the opinions of the farmer. The roles of feed and cereal crops are indicated by the predominance of rape greenfeed and wheat in the rotations. Alternative practices are to summer fallow the land for autumn-sown wheat or to sow spring rape for lambs before autumn wheat; from these beginnings rotations are likely to vary according to the fertility of the soil, custom, or the influence of the farm programme at the time. Though some farmers may include two or even three cereal harvests in the rotation, they alternate these fertility-demanding crops with rape, turnips, or some other feed crop. In general, rotations are:—Lea: fallow: wheat: rape and turnips: oats for feed: barley: sown to pasture; or lea: rape: wheat: rape or greenfeed (oats or barley): sown to pasture.

Dreadnought and Cross 7 are the two varieties of wheat most widely grown. In a fair season yields of more than 50 bushels per acre are expected, and in a good year many farmers expect 60 bushels and yields of 70 bushels are not uncommon.

Oats are widely grown for greenfeed and for chaff, and Black or Cape barley is also favoured for early greenfeed on many farms.

Rape is commonly grown to supplement the summer feed for fattening of lambs and cull sheep. Though the lambing is planned to coincide with the first signs of spring growth of pastures, so that the farm is carrying the maximum of sheep at the time of maximum pasture production, the rape crop is required in late summer when pastures are past their best.

Turnips are uncertain in this area, where dry spells may be experienced and the crops are likely to wither and become susceptible to blight and disease. Sometimes the seed fails to strike. The acreage in turnips has declined remarkably during the past 12 years, being replaced largely by greenfeed, saved pasture, chou moellier, and lucerne hay. Small stands of lucerne on a number of farms usually provide three cuts for hay as well as supplying a valuable supplement for all stock in autumn and winter.

Limeworks such as this one in North Otago are contributing toward making the district one of the major lime-producing areas of New Zealand, and the limestone is of high quality. [*J. U. Macaulay photo.*

Sheep grazing on greenfeed oats on the Waitaki Plains. On the shallow, stony soils abundant supplementary feed can be provided for stock by the use of a sound rotation to build up the fertility of the soil until a good pasture based on subterranean clover can be maintained.

On most farms on Timaru soil where fat-lamb production is the foremost aim, Southdown, Border Leicester, and Romney crossbred rams are mated with Romney and crossbred ewes. For flock maintenance combined with fat-lamb production Romney rams are commonly used. The considerable number of farmers who must buy in ewes to replenish their flocks have a variety of methods: A few buy in ewe lambs in autumn; some buy hoggets or 2-tooth ewes in autumn; and others buy sound 4-year-old ewes which produce for two or three seasons before they are fattened for the freezing works. The districts whence these replacement ewes come are the Palmerston-Dunback area, South Otago, and the Kauroo Hill area within the county.

Lambing in early September is general and the lambing percentage is between 100 and 120. The percentage of lambs fat off the mothers varies from 33 1/3 to 80. The remainder for fattening go on to rape, aftermath hay paddocks, and pasture for a few weeks before going to the freezing works.

Autumn feed is often so scarce because of summer drought conditions that an early start must be made with feeding out lucerne and meadow hay, chaff, and chou moellier, which continues through the winter. Early-spring feed is required for the ewes before they lamb, and greenfeed from oats, barley, wheat, and young pasture may be used for this purpose.

Dairy farming is followed on some of the smaller holdings on Timaru soil, especially near Oamaru. Herds producing milk for town supply include cows of Shorthorn-Jersey cross and of the Friesian and Ayrshire breeds.

Ngapara Soil

A fine sandy loam developed in a drier climate, the Ngapara soil is shallower than the Timaru soil. Healthy sheep country and friable soil for cropping are characteristic of the area. Though sheep farming is now general, cropping was more important in the early days and well into the present century.

Crop rotations are somewhat similar to those on Timaru soil. Conditions are favourable for the production of good malting barley and it is a popular cash crop. After the first cultivation from pasture swedes do well, and it would appear that the higher altitude and nightly dews contribute to the success of this crop. Typical rotations are:—Lea: wheat: barley or oats: rape: pasture sown with or without rape; or lea: rape or swedes: wheat: rape or barley: pasture sown with oats.

The pasture mixture generally sown includes 1½ bushels of perennial ryegrass, 2 or 3lb. of white clover, 3lb. of Montgomery red clover or cowgrass, and a few pounds of cocksfoot; some farmers include a little subterranean clover and crested dogstail. Winters tend to be longer on this area than nearer the sea coast and the growing season for pastures is approximately from early October to May. Ngapara soil, which responds quickly to drought and rainfall, suffers in the dry spells that often occur in January and February. Though much of the soil overlies limestone formations, the topsoil is lime deficient and on most farms lime is applied at up to 1 ton per acre, generally on young pasture. Superphosphate is applied with all crops and some is used for topdressing pastures.

The most common ewe is the Romney crossbred, but half-bred and three-quarter-bred ewes are also widely used. They are mated with Border Leicester, Romney, and Southdown rams. Lambing takes place about mid-September and results are generally from 100 to 130 per cent. Between 30 and 50 per cent. of the lambs go away fat off the mothers and the remainder for fattening are finished on rape. Some farmers sell store lambs locally and down country; others with plenty of rape available buy in lambs for fattening. For replenishment of their ewe flocks many farmers select their own lambs by Romney rams, some buy 4-year-old ewes off the hill country around Livingstone, and others go further afield for Romney crossbred lambs or 2-tooth ewes.

Lucerne is an important crop and does well on Ngapara soil. Three crops of lucerne hay are obtainable in a favourable season to provide the basis of autumn and winter feeding. The feeding programme may be summarised as good hay, turnips, swedes, and chaff in winter, and greenfeed barley, oats, and Italian ryegrass in early spring.

Waiareka and Oamaru Clay Loams

Notable characteristics of the Waiareka and Oamaru soils are their reserve of fertility, their ability to grow several crops well, and their capacity for holding moisture in a naturally dry climate, but they are difficult to cultivate under unfavourable conditions. The stickiness of these soils when wet gives them the local name of "black tar", and when they are in this condition cultivation is impossible.

The fallow is the foundation of the cultivation programme. Ploughing, discing, and grubbing are done from early summer to early winter in dry weather and the surface is left rough. Large, hard clods may form, but they break down with winter frost and rain to give a free surface after being harrowed. Three ploughings with heavy tractors are common, the first being shallow and the others successively deeper.

These rich soils have many uses, so farming practices vary. Some farmers have a long rotation of 5 or 6 years' cropping before sowing land down to pasture; others may take only one or two crops to clean the ground of weeds before returning it to pasture. Dairy farmers may prefer to start with feed crops of swedes, mangolds, and chou moellier and then fallow the land for greenfeed oats or barley. On the arable mixed farms and a few dairy farms cropping is of greater importance. After the first crop of wheat, frequently out of lea ground, there is a wide choice of following crops, including oats, barley, rape, swedes, mangolds, wheat, mustard, and chou moellier. Barley is usually grown after

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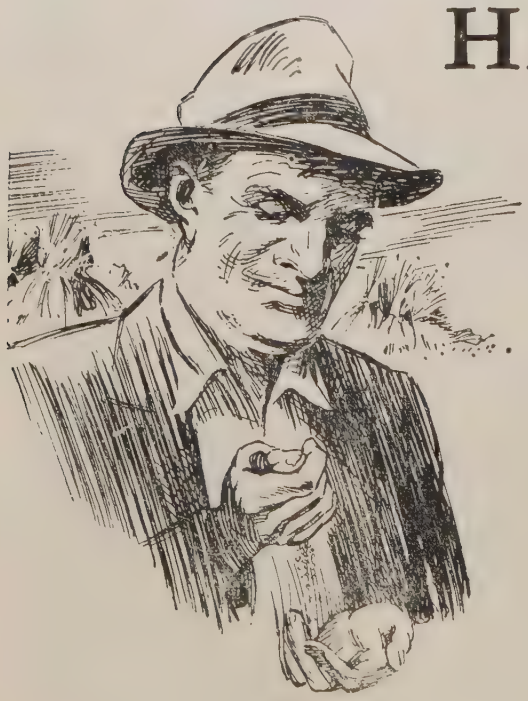

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a crop of wheat, as the fertility of the land is too high otherwise. Brassica crops which are not repeated in the same soil because of the danger of club root or dry rot may be separated by a cereal crop.

An arable farm may have from a ninth to a sixth of the total area in wheat. Of the two popular varieties, Dreadnought yields from 10 to 15 bushels per acre more than Cross 7, but is more difficult to harvest, as direct heading it is not practicable. The expected yield from either variety is more than 50 bushels per acre. Both oats and barley are grown for greenfeed, and some farmers allow wheat to be grazed in early spring.

Because of the long winter, pastures alone do not provide sufficient feed for the stock and supplementary feed must be produced. Swedes, mangolds, and chou moellier, with lucerne, hay, and chaff, are used to provide adequate rations during this period. Young grass, greenfeed, and pasture saved for autumn and early spring are also valuable. Pastures are the foundation of the farm economy on the Waiareka and Oamaru soils, and they carry many excellent swards. The crop rotation may require the ploughing of a good pasture of only 3 or 4 years' standing, but the soil is so fertile that cropping in rotation is more profitable. When rainfall is adequate short-rotation ryegrass and white clover grow well. Some farmers prefer Italian ryegrass and red clover for early-spring and winter feed.

Lime is customarily applied before the land is sown down to pasture or after the young grass has been established, usually at 1 ton per acre, but varying according to the requirements of the soil.

Fat lambs from Romney crossbred and Romney ewes mated with Southdown, Border Leicester, and Romney rams are produced in this region. From 50 to 70 per cent. can be drafted fat off the mothers and the remainder are put on rape for a few weeks to reach the desired condition. Store lambs are brought in from other districts for fattening. It is common to sell all lambs fat, but a few farmers using Romney rams keep their own flock replacements. Many buy in 2-tooth or full-mouthed ewes, preferring those from southern districts, which may be bought at the local saleyards in autumn. Shearing is done usually in November and December.

In the valleys of Waiareka and Kakanui several dairy farms produce whole milk for Oamaru Borough or for a Dunedin factory. About 60 acres of this soil are required for an economic unit. Though some farmers on factory supply may follow a general rotation including cereals, the large herds on town supply require a rotation such as lea: chou moellier: mangolds and swedes: fallow: oats: short-rotation pasture of Italian ryegrass and cowgrass sown with oats.

Seed production has formed an important item in the economy of many mixed farms in recent years. Ryegrass, white clover, cocksfoot, and Montgomery red clover are harvested. On small farms poultry and pigs may be of some importance, and market gardening has increased rapidly in recent years.

On the shingly soils of the Waitaki Plains lucerne is a valuable crop. It provides reserves of hay for feeding out and is a good source of grazing in a drought.

Farming on the Plains

Sheep farming is general on the plains area of Waitaki County, the light soils restricting cropping mainly to the provision of feed crops.

Waimakariri-Paparua and Steward Soils

The Waimakariri - Paparua and Steward soils comprise a shallow and stony area on the south of the Waitaki River from the coast to Duntroon. Many properties are held on lease in perpetuity at a rental of a few shillings per acre; carrying capacity of the unimproved land is from 1 to 1½ sheep per acre. Holdings tend to be large, a quarter of them being of more than 700 acres and the average of all farms about 400 acres. Cropped extensively in the past, this land is now used mainly for sheep raising. Abundant supplementary feed is provided for the stock by the use of a sound rotation to build up the fertility of the soil until a good pasture based on subterranean clover can be maintained. Subterranean clover is of particular value, as it will remain as a permanent constituent of the pastures, whereas white clover is unreliable, especially in the frequent dry summers.

Subterranean clover is sown with turnips in early summer or in a pasture mixture in autumn. It is usually drilled at the rate of 3lb. per acre with 1cwt. of phosphatic fertiliser per acre. On this country the use of subterranean clover has raised the carrying capacity from 1 sheep per acre or less to 2 to 3 sheep per acre. Where the land is infested with couch (*Agropyron repens*) or browntop (*Agrostis tenuis*) and fescue, 4 years may be required to clean the land before it is sown to pasture. The rotation is characterised by sheep-feed crops of rape, turnips, greenfeed oats, barley, ryecorn, and grass. An apparent difference from practices on the more fertile soils is in the small amount of cereals grown, especially wheat.

The general plan is to plough the lea in early winter and leave it to weather before further cultivation for the sowing of rape, turnips, or greenfeed. Autumn-sown oats and grass, including Italian ryegrass, may follow rape, and spring-sown oats, barley, or rape may follow the turnip crop. After two feed crops it is common to sow down the pasture with a nurse crop of rape, oats, or barley. Though pastures do better when sown alone, the early bite of greenfeed is useful and also protects the tender grasses and clovers from frost effects.

Fields are large, many of them between 30 and 80 acres, because big areas of feed crops are grown to compensate for the low yields expected in a dry year. In the preparation of a good seed-bed consolidation with a heavy roller is necessary. Pastures generally are not good because of hot, dry summers and winter frosts, so provision must be made for extra feed for the greater part of the year. The basis of good pasture is subterranean clover and perennial ryegrass, and the value of subterranean clover on this class of soil cannot be overstressed.

Most farms have a paddock of lucerne, which grows well on the better soil near the river. In a good season three cuts for hay may be obtained. For the winter feeding programme hay is essential; if insufficient is harvested, some must be bought from other districts. That it pays to apply lime not only to the lucerne plot but also to the young grass and pastures is now evident to most farmers.

Flocks in this area contain Romney, Romney crossbred, half-bred, and three-quarter-bred ewes. Though some Southdown rams may be used for fat-lamb production, conditions on these soils are not suitable for getting lambs fat off the mothers. Therefore many farmers use Romney rams, which enable them to maintain their flocks with their own ewe lambs and to fatten the remainder on rape or sell them as good lines of stores. Dairy farming is impracticable, but on some properties including river flats and swamps beef cattle are run.

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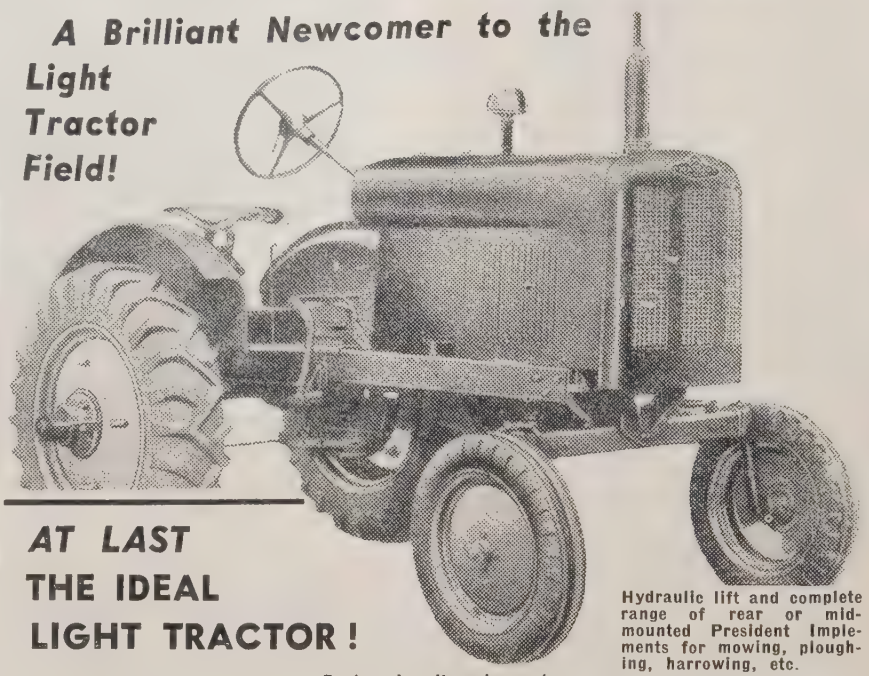

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Pukeuri-Wakanui Soils

The productive Pukeuri-Wakanui soils lie north of Oamaru and extend along the foot of the downs to about Georgetown. Holdings average about 250 acres with about three-quarters of them smaller than 350 acres, and mixed farming is general. Typical rotations are:—Lea: wheat: rape: oats: pasture; or lea: rape: wheat: barley: pasture.

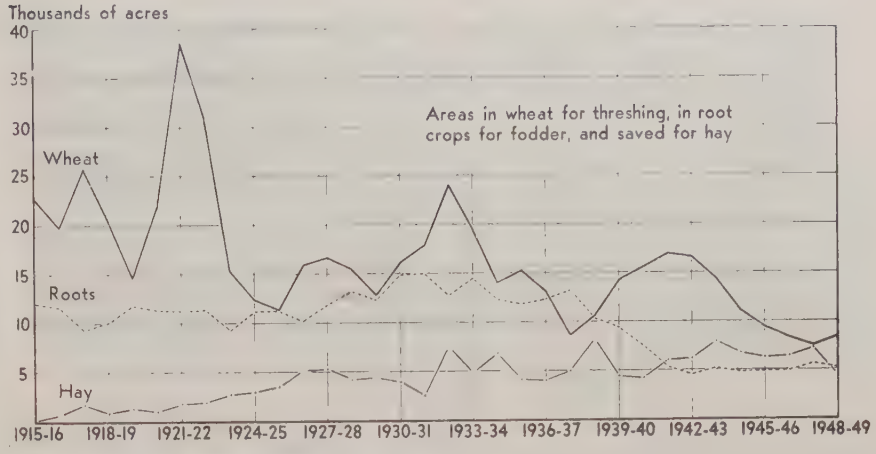
Farming practices are similar to those on the adjacent Timaru soil of the downlands. Pastures are generally good, with white clover persistent on these rich soils. Lucerne has proved a reliable crop from which three cuts a year for hay may be obtained. Ryegrass and clover seed crops are important on many farms in favourable seasons.

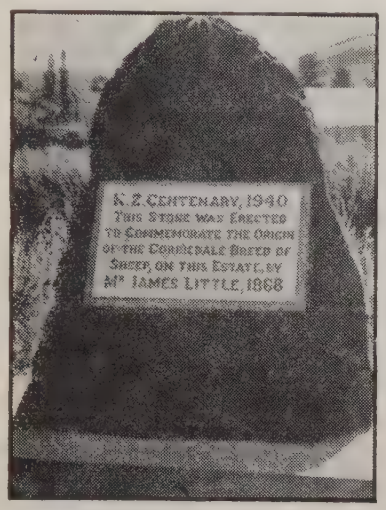
Romney-cross ewes and Southdown rams for fat-lamb production are most commonly carried, and lambing percentages are high. Beef cattle are run on a number of farms. Farmers commonly buy in forward cattle in early spring and sell them as prime fat cattle in summer.

Sheep Farming

Sheep farming has been of widespread importance in the economy of Waitaki County from the time the early settlers introduced their Merino sheep. Eager to develop a breed suitable to the environment, James Little, as shepherd to Dr. Webster on the "Corriedale" property near Windsor, experimented with the inbreeding of the progeny of Romney-Merino halfbreds. The results were the forerunners of the Corriedale breed, which as a dual-purpose sheep has proved ideal for much of this country.

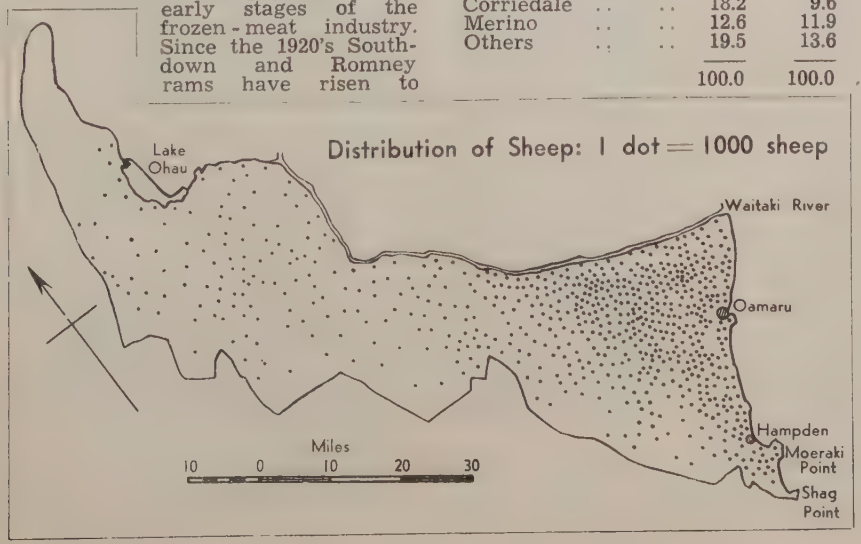
Another innovation of great consequence was refrigeration, which led to the rapid growth of ewe flocks of early-maturing breeds. The Border Leicester breed was popular in the early stages of the frozen-meat industry. Since the 1920's Southdown and Romney rams have risen to importance for producing early lambs from crossbred ewes. The significant trends are:—




N.Z. CENTENARY, 1940
THIS STONE WAS ERECTED
TO COMMEMORATE THE ORIGIN
OF THE CORRIEDALE BREED OF
SHEEP, ON THIS ESTATE, BY
Mr JAMES LITTLE, 1868

RAM BREEDS AS PERCENTAGES OF TOTAL RAMS

Breed	1920	1949
Southdown ..	0.5	32.2
Romney	6.1	21.9
Border Leicester ..	43.1	10.8
Corriedale	18.2	9.6
Merino	12.6	11.9
Others	19.5	13.6
	100.0	100.0



This development of intensive fat-lamb production is borne out by figures for the Pukeuri freezing works, which show from 1921 to 1947 an increase of 130 per cent. in total lambs killed and 180 per cent. in killings of milk lambs; that is, lambs mainly off the mothers before the end of February.

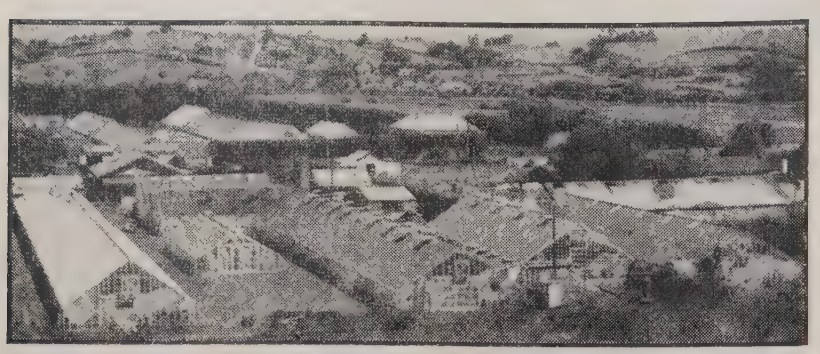
In the past half-century the proportion of breeding ewes as a percentage of total sheep has increased as follows: 1901, 47; 1910, 51½; 1920, 55½; 1930, 57, 1940, 60; 1945, 56; 1949, 66. This illustrates the growth of intensive sheep farming after the subdivision of estates in the early 1900's. This growth continued from 1920 with the use of Southdown and Romney rams and improved pastures of Certified strains of ryegrass and white clover and with topdressing with lime and fertiliser.

While the general trend of sheep numbers has been upward, trends vary on different soil types. The decline in the high-country flocks compared with the marked increases elsewhere is the most significant feature; bad subdivision and deterioration of the vegetation mainly account for this fall. On the downlands and Waiareka soil the large increases in sheep numbers have been mainly the result of improvement of pastures, mechanisation of farming, and the decline of cereal production and dairy cow numbers. On the foothills the decline in cattle population has also contributed to the increase of sheep numbers.

Cropping

With the gold rush to Otago from 1861 wheat production rose to importance in Waitaki County, which earned a name for cereal production in the 1870's and 1880's, when large acreages were grown on the estates. Wool prices had fallen from 24d. per pound about 1870 to 4d. per pound in 1879; this favoured wheat production, which reached a peak of 38,363 acres in 1880-81. Much of the low country was heavily cropped about the time of subdivision of the estates. Many of the new settlers needed cash to pay the rent, which in several places was found to be high. Share cropping was common at a rent of one bushel in four or five.

The fall in wheat acreage during the First World War was largely caused by labour difficulties. The remarkable increase from 14,700 acres in 1919 to 38,700 acres in 1921 is accounted for by the return of the men and by high wheat prices when both wool and meat



[*J. U. Macaulay photos.*

Above—Glasshouses at Kakanui in which tomatoes and grapes are grown. Below—Market gardens on the rich Waiareka soil of the Totara district some 6 miles south-west of Oamaru. In recent years the area of market gardens in this district has increased considerably.

prices were falling. High returns in the sheep industry followed, discouraging wheat growing. In the depression which began in 1931 wheat production rose while the overseas markets for wool and meat deteriorated, but it fell again with the return of prosperity to sheep farming. The peak production of the 1940's marks the response of farmers to the demands of war. The area in wheat has fallen in recent years with the satisfactory prices of competing products—fat lambs, wool, and small seeds. This decline has been more marked on the plains than on the richer downlands and Pukeuri soils.

Yields from Dreadnought are consistently higher than from other wheat varieties, but this variety tends to "shake out" and, unlike Cross 7 and Fife Tuscan, cannot be direct headed by machine.

The acreage in oats for threshing fell between 1915 and 1949. Oats for chaff and hay were important during the depression of the 1930's but have since declined in importance, largely because of the decrease in numbers of horses and the rise of mechanised farming.

From 1920 until recent years the area in barley fluctuated from about 500 to 1000 acres, but in 1944-45 it reached 2741 acres and in 1948-49 3012 acres.

The most significant change in sheep-feed crops has been the fall in production of root crops of swedes, turnips, and mangolds, which have been displaced by chou moellier, hay, and greenfeed, including new pastures, oats, and barley.

Market Gardening

Intensive use of land for market gardening has advanced considerably during the past 10 years on the Waiareka soil. The total area of Waitaki County in market gardens varied between a few acres and a hundred until 1938, since when it increased steeply and in 1949 exceeded 600 acres.

The Waiareka soil area is commercially important for producing the bulk of early- and late-season vegetables for the southern markets of New Zealand. This seasonal specialisation is dictated by the climate, which shows a tendency toward summer drought. The aspect of the land is important; a gentle slope to the north for sunshine and protection from the cold southerly winds is preferred. This fertile soil, formerly in arable mixed farms, lies under an oceanic climate where serious frosts are rare.

Vegetable production does not follow a systematic rotation apart from the general rule that brassica crops of brussels sprouts, winter broccoli, and cabbage are planted after the lifting of early potatoes. Between 100 and 200 acres of potatoes, mainly of the Jersey Bennes variety, are dug from late October to January. Sowings of lettuce are made at intervals to provide a continuous harvest. Products are marketed as follows:—

Spring: Lettuce, cabbage, potatoes, peas, cauliflower, and broad beans.

Summer: Lettuce, peas, potatoes, beetroot, spinach, cauliflower, runner beans, and broad beans.

Winter: Broccoli, brussels sprouts, lettuce, spinach, cabbage, beetroot, marrows, and pumpkins.

Rich soil, good aspect, favourable climate, excellent rail and road transport to markets, and the availability of casual labour from Oamaru are all factors contributing to the success of market gardening in this area.

A few plots of rhubarb, strawberries, and raspberries are grown. Nearly all the tomatoes produced are grown under glass. The Kakanui district has long been noted for its grapes, popular varieties of which are Black Hamburg and Gros Colma.

Dairy Farming

In the valleys of the downlands dairy farming has been of some importance, mainly during three periods, showing the effect of economic influences: The early 1900's after subdivision of estates and establishment of creameries in the area; the post-war period 1922-25, when prices for dairy products were relatively high; and the depression years of the early 1930's, when farmers sought to supplement their income with regular cream cheques. At present there are only 59 herds of 20 or more cows in the county.

Pig keeping, which is closely associated with dairy farming, has followed a similar pattern.

Poultry Farming

The low country has a climate ideal for poultry husbandry. Fresh eggs from high-quality White Leghorn, Black Australorp, and crossbred fowls go to local and city markets. There are 115 poultry flocks with more than 450 fowls, and of these 70 per cent. are near Oamaru or Herbert.

Beekeeping

Bees are of some importance in the county for both pollination and honey production. The concentration of beekeeping is greatest on the soils of the downlands and on the Pukeuri-Wakanui and Waiareka soils, where white clover is widespread and fairly persistent. There are about 2300 hives in these areas.

A few hives are maintained on the river flats and in valleys of the high country above Kurow and on the plains below Georgetown.

Future Lies in Sheep Farming

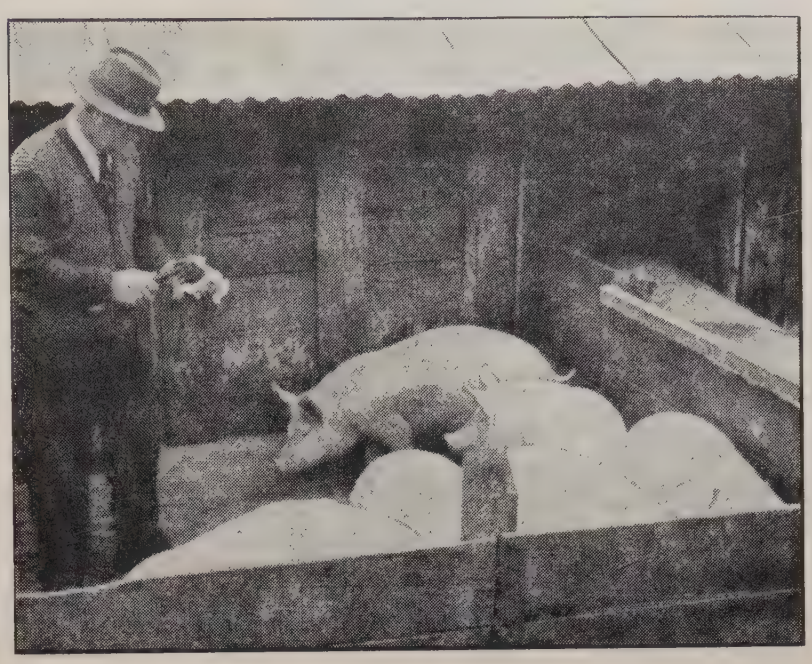
Waitaki County makes a significant contribution to the national economy. Of the 32,845,000 sheep in New Zealand in 1949 Waitaki had 677,000; of the 146,700 acres in wheat the county had 8400 acres.

Since the early 1920's increasing carrying capacity has been a feature of farming on the improved lands of the low country, where the significant trend has been the increase in numbers of breeding ewes, which are the foundation of the fat-lamb industry. Greater production will be achieved by further development of the sheep industry based on improved farm practices. Some prospects exist for irrigation and the extension of the area of subterranean clover on the plains and for an increase in the proportion of good pasture elsewhere.

Importance of Performance Records of Pigs in the Selection of Breeding Stocks

AT present pig producers generally attach little importance to performance records in selecting their breeding stock. In this article I. H. Owtram, Extension Officer in Pig Husbandry, Department of Agriculture, Wellington, explains the value of such records in efficient pig production.

PIG production in New Zealand is a subsidiary of the dairy industry. The tremendous progress achieved by the dairy industry in production during the last 20 years has in no small measure been due to the herd-testing movement, which has enabled the dairy farmer to improve his farm and herd management and to breed better and better dairy cows. Herd testing is simply performance recording of dairy cows, and the farmer today fully appreciates its value. Unfortunately he has little appreciation of its value in pig production. In other pig-producing countries its value has been realised, notably in Denmark, where an efficient pig industry is based on breeding from tested stock.



Marking pigs for the carcass-quality evaluation scheme.

There is only one objective in pig production—a carcass to be used as fresh meat (pork) or cured meat (bacon), and the carcass must be of the quality the consumer requires. The producer also wishes to make the maximum profit out of his pigs. Therefore he requires to know whether his breeding stock or the stock he intends to purchase will produce the right type of carcass and how efficiently his pigs will convert their food into saleable meat. Performance records will tell him.

Crate for weighing pigs for litter recording.

Performance recording of pigs is in two parts: First, litter recording, and secondly, carcass-quality evaluation and growth rate.

Litter Recording

Litter recording can be either official or unofficial. Official litter recording is carried out by the Department of Agriculture and is designed to deal with pedigree stock only. Unofficial litter recording is carried out by the supervisors of the district pig councils and is designed to deal with both pedigree and crossbred breeding stock.

Official Recording

For pedigree stock that the farmer wishes to be officially recorded a nomination form is filled in at least 3 weeks before the sow is due to farrow, giving details of the sow's breeding and that of the mating sire. This is sent to the secretary of the New Zealand Pig Breeders' Association, Palmerston North. At the same time a notification is sent to the Superintendent of the Pig Industry, Department of Agriculture, Wellington, with a fee of 5s. for each litter recorded.

The secretary of the New Zealand Pig Breeders' Association checks the details of the breeding of the sow and the mating sire, records the nomination, and informs the Department, which advises the local Inspector of Stock and the owner of the sow that the nomination has been received. The owner of the sow tells the Inspector of Stock when the sow farrows so that he can arrange to weigh the pigs at 21 days old and 56 days old. This weighing of the pigs is litter recording.

The weight of the litter at 21 days gives a measure of the sow's ability to produce and rear good litters and of the ability of her owner in the management of his breeding stock. The weight at 56 days indicates mainly the owner's ability in managing litters while they are still being suckled, a point of the greatest importance in pig production, as it is during this period that pigs are capable of making the greatest use of the food that they are fed.

At the second weighing the pigs are weighed individually and marked by the Inspector of Stock, who sends advice of the weights to the Department's office in Wellington, where they are recorded. A copy of the details is sent to the owner and the grade that the litter has gained is included.

Litters are graded into 5 grades according to weight as follows:—

Grade	Minimum weight at 3 weeks	Minimum weight at 8 weeks
	lb.	lb.
1	120	360
2	100	300
3	90	270
4	80	240
5	70	210

The grade of the litter is decided on the results of both weighings; for example, a litter weighing 110lb. at 3 weeks and 299lb. at 8 weeks would not qualify as grade 2 because the second weighing is below the standard. Such a litter would come into grade 3.

Unofficial Recording

Unofficial litter recording differs from official litter recording in that sows other than registered pedigrees can be recorded, no fee is charged, and the owner simply notifies the supervisor of his district pig council when the sow has farrowed. The pigs are weighed in the same manner as for official recording and one copy of the weights is sent to the Department of Agriculture in Wellington, the owner receives another, and a third is kept by the district pig council.

To both the breeder and the purchaser of breeding stock litter records are invaluable. A series covering several generations of a strain gives a clear picture of the ability or otherwise of that strain to produce and rear large litters of heavy pigs and this is the foundation of efficient and successful, and therefore profitable, pig production.

Carcass Quality and Growth Rate

The second part of performance recording of pigs is carcass-quality evaluation and the recording of growth rate, which are carried out together. These tell the producer what sort of carcasses he is turning out so that he knows to what degree they are suitable for the market (porker or baconer) in which they are sold. Though it is generally acknowledged that the type of food used and feeding management can make a great difference to carcass quality, the inherent characters of the pig, governing length and other carcass-quality characteristics, are also important. In selecting breeding stock for improvement of these characters it is essential to have some information on how pigs were fed or at least a record of their growth rate. For this reason carcass-quality reports, in which growth rate is also recorded, are of vital importance in the selection of breeding stock, as they tell the breeder whether his selection is improving the quality of the carcasses of his particular strain or not. A further important reason for keeping a record of the weight for age or growth rate of pigs is that it is a factor which has a direct bearing on the profit to be made out of the pigs, a most important point, as that is what the farmer keeps pigs for.

Carcass-quality Reports

Carcass-quality reports are obtained first through the district pig councils, whose supervisors will, at the request of the owner, mark pigs on the farm some time before they are sent to be killed. When these pigs are sent to the killing point, either freezing works or abattoir, information on their breeding and date of birth and the mark they are carrying is given on a special docket (C.Q.S.1) attached to the trucking invoice. Carcasses are weighed and the length (from the H bone to the junction of the first rib and the sternum) and the thickness of the back fat at the shoulder and loin are measured. These measurements, the weights, the dates of birth and of slaughter, and details of breeding are sent to the Department of Agriculture's office in Wellington. Here points are allotted for the carcass measurements and the growth rate is worked out. This information with a complete report on the carcass quality is sent to the producer of the pigs. Records are also kept by the Department. In addition records of the sires of all stock evaluated under the scheme are kept and when a sufficient number of records of stock sired by boars bred by one breeder is on hand a separate report is sent to that breeder on the carcass quality of the stock that his boars are producing.

Litter records and carcass-quality and growth rate reports tell the owner how successful he is as a pig breeder, and for a purchaser the reports are the only real guide as to the suitability of the breeding stock he is offered for improving or maintaining the standard of his pigs.

If pig producers would make as much use of performance records as dairy farmers do of those from herd testing, the pig industry would make equally good progress. Pig producers when buying breeding stock should ask for performance records.

METEOROLOGICAL RECORDS FOR OCTOBER

Station	Height of station above M.S.L. (ft.)	Air temperatures in degrees (Fahrenheit)				Rainfall in inches					Bright sunshine hours
		Approx. mean	Difference from normal	Absolute maximum and minimum		Total fall	No. of days of rain	Difference from normal	Maximum fall		
				Maximum	Minimum				Amount	Date	
Kerikeri	201	57.4	+ 0.6	74.5	38.3	2.73	11		0.73	22	186.7
Auckland	160	58.4	+ 1.0	72.4	43.1	3.75	18	— 0.26	0.91	4	155.9
Tauranga	10	55.8	+ 0.2	70.8	33.0	4.25	16	— 0.69	1.58	1	184.6
Ruakura	131	54.3	+ 0.0	69.2	31.2	4.61	17	+ 0.60	0.83	18	141.7
Rotorua	969	53.6	+ 0.6	70.0	33.0	5.60	19	+ 0.60	1.08	22	155.0
Gisborne	12	56.5	+ 0.5	72.9	35.3	3.09	20	+ 0.85	0.80	22	192.6
New Plymouth ..	160	54.6	+ 0.2	65.2	37.4	5.63	21	+ 0.06	1.92	4	131.0
Napier	5	57.8	+ 1.3	78.4	34.3	1.50	12	— 0.42	0.30	7	193.5
Kariol	2125	49.0	+ 0.8	66.0	29.0	6.79	22	+ 2.90	1.29	26	
Wanganui	72	56.0	+ 1.2	72.9	39.2	4.39	22	+ 1.04	0.74	18	143.1
Palmerston North .	110	55.2	+ 1.3	71.8	34.0	7.35	24	+ 3.80	1.17	18	130.6
Waingawa	350	53.2	+ 0.5	72.0	33.0	6.97	26	+ 4.07	1.22	6	151.0
Wellington	415	53.0	+ 0.2	68.2	37.9	7.67	19	+ 3.78	2.14	4	113.7
Nelson	24	54.5	+ 0.4	69.0	34.8	4.53	17	+ 0.99	1.03	20	199.5
Blenheim	12	54.4	+ 0.2	71.8	31.1	4.52	17	+ 2.37	1.36	6	206.7
Hokitika	12	52.2	+ 1.2	64.0	33.5	8.18	24	— 3.18	1.18	15	137.5
Hanmer Springs ..	1225	49.8	— 0.8	72.0	30.0	7.98	21	+ 4.09	1.35	6	151.4
Christchurch ..	22	52.8	— 0.3	76.2	35.2	3.24	16	+ 1.38	1.16	22	158.3
Ashburton	323	52.5	+ 0.1	74.8	31.8	4.45	16	+ 2.25	1.46	5	153.8
Timaru	56	51.6	— 1.1	75.0	33.0	3.25	11	+ 1.39	0.94	5	159.3
Alexandra	520	51.6	— 0.8	70.7	30.6	1.05	13	— 0.18	0.29	29	166.5
Taieri	80	50.4	— 0.7	72.9	32.2	1.84	16	— 0.35	0.47	5	134.1
Invercargill ..	32	51.0	+ 0.3	72.0	37.0	2.64	9	— 0.94	0.52	30	148.6

World Census of Agriculture

Jersey and Polled Angus Most Popular Cattle Breeds in New Zealand

THE spectacular rise in popularity in New Zealand of the Jersey and Polled Angus breeds of cattle and the decline of the Shorthorn breed for both dairy and beef purposes are shown by statistics collected last year and used to provide data for the 1950 World Census of Agriculture.

Breeds of cattle in New Zealand have been enumerated in official statistical publications in 1918, 1921, 1924, 1928, and 1950, and on the last three occasions the numbers of Shorthorns were given separately for dairy and beef cattle. Although a precise division of all cattle into dairy and beef breeds is available for 1950 only, a very close approximation can be obtained for the years 1924 and 1928 by taking the four leading breeds in the dairy section and three leading breeds in the beef section. Numbers for other breeds are so insignificant that they can be disregarded.

The following table, which is based on the numbers of cows 2 years old and over, shows the percentages representing each breed in the 3 years 1924, 1928, and 1950. The data for 1950 are from the "Monthly Abstract of Statistics" for July 1951.

DAIRY BREEDS

	1924 Per cent.	1928 Per cent.	1950 Per cent.
*Jersey	44.4	63.6	85.0
Friesian	13.1	11.8	6.0
Ayrshire	2.9	2.7	3.1
Milking Shorthorn .	39.6	21.9	5.9

* Including other Channel Islands breeds.

BEEF BREEDS

Polled Angus ..	20.8	30.4	69.6
Hereford	35.1	36.4	24.3
Beef Shorthorn ..	44.1	33.2	6.1

The Home Garden in January

By H. P. THOMAS, Vegetable Instructor, Department of Agriculture, Wanganui

ALTHOUGH by January there will be a wide range of vegetables at varying stages of maturity in most gardens, the earlier enthusiasm of gardeners must not abate at this stage if a continuity of supplies is to be maintained. Further plantings should be made of such crops as savoy cabbage, broccoli (heading and sprouting), borecole (curly kale), brussels sprouts, celery, and leeks to assist in maintaining supplies during the important period from late autumn to early spring.

SUFFICIENT sowings and plantings during December, January, and February for the production of winter- and early-spring-maturing vegetables will also make it less necessary to sow seeds very early in spring, when conditions are often not suitable for germination and growth.

In many districts January provides the last opportunity for making sowings of peas, beans (dwarf and climbing), carrots, and swedes to mature before winter. Beetroot, lettuce, parsley, radish, spinach, silver beet, spring onions, and turnips may also be sown during January.

Weeding is another most important garden operation at this time, and every advantage should be taken of fine weather to cultivate between growing crops. Light cultivation with a hoe should be frequent enough to check weeds, which if left for long, rob plants of food and moisture and also act as hosts for insect pests and plant diseases. Hoeing should where possible follow watering or rain and should be done as soon as the surface is sufficiently dry to work.

Attention should also be given to thorough waterings or, better, some method of crop irrigation during the period from early January until autumn rains begin.

Advantage should be taken of any showers for planting out seedlings of celery, leeks, silver beet, spinach beet, and the various brassicas.

Seedlings should be thinned as soon as they are large enough to handle. A second thinning may sometimes be necessary. Care should be taken to avoid disturbing the remaining plants unduly, and if it seems necessary, seedlings should be watered well immediately after being thinned.

[*Sparrow Industrial Pictures Ltd. photo.*

If runner beans are pinched back when they have reached sufficient height and if beans are picked regularly, the plants should crop well until they are cut down by frost.

[*Green and Hahn Photography Ltd. photo.*

REMINDERS FOR JANUARY

Sow: Beetroot, beans (dwarf), *beans (climbing), carrots (early short horn varieties), cress, †cabbage (spring), cabbage (Chinese), endive, kohl rabi, lettuce, mustard, onions (spring), peas (dwarf), parsley, parsnip (oxheart), radish, spinach (New Zealand), silver beet, swedes, tampala, turnips.

* Immediately and only in districts free from early frosts.
† In southern districts.

Plant: Broccoli (heading and sprouting), brussels sprouts, borecole (curly kale), cauliflower (autumn), cabbage (autumn and red or pickling), celery, celeriac (late planting), leeks, spinach beet, silver beet, savoy cabbage.

Pruning, tying up, liquid manuring, and spraying of tomato plants should be continued.

Main-crop potatoes should be kept well earthed up and spraying should be continued to prevent late blight and potato tuber moth attack. Bordeaux mixture (4oz. of bluestone and 5½oz. of hydrated lime to 4 gallons of water) will control late blight, and arsenate of lead (1½oz. to 4 gallons of water) is used against the tuber moth.

Kumara runners should be lifted periodically to prevent their attaching themselves to the soil. The tubers will benefit by this regular attention.

Crops susceptible to attacks by pests and diseases should be sprayed before these troubles become established.

Liquid manure, which will give an added fillip to growing crops, can be made easily by suspending animal manure in a sack in a tub or barrel of water; from 1 to 2lb. of fresh manure should be used to each gallon of water. The manure can be applied to most crops, particularly salad crops, at this time.

Peas and beans should be picked regularly and before they become over-mature. If this is done, production is extended and the beans are more tender.

In large gardens where already there may be space to spare the ground should be sown in some kind of green crop rather than left idle.

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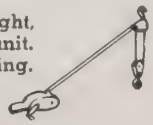

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G&G

Asparagus

Young asparagus beds and beds on which cutting was stopped in December will benefit from a dressing of farmyard manure, compost, or a good handful of blood and bone manure to each crown; in addition any available dry wood ash should be applied. The remaining top fern growth should not be removed until it begins to turn yellow, but it should be disposed of before the seed ripens fully. The change of colour indicates that the foliage has served its purpose and is no longer of any use to the dormant crowns. The bed should be kept free of weeds, and staking of fern growth may be necessary in some instances.

[*Sparrow Industrial Pictures Ltd. photo.*

The top fern growth of asparagus should not be removed until it begins to turn yellow, but it should be disposed of before the seeds ripen fully.

Beetroot

A further sowing of beetroot may be made in most districts during January. The situation for beetroot should be open and sunny and the crop should be grown in a soil that has received a dressing of organic manure for a previous crop. Beetroot is very sensitive to soil acidity, and where the soil has not been dressed with lime recently an application of 3 to 4oz. per square yard should be worked in some time before sowing. If a fertiliser is considered necessary, a dressing of blood and bone mixed with twice its weight of superphosphate should be used at the rate of ¼lb. per square yard or about 2oz. to 6ft. of row.

At this time of year globe or turnip-rooted types are usually sown. Plenty of moisture should be maintained during growth. If conditions are not hot or dry, seedlings thinned may be transplanted directly, but if this is done, they should be watered in after being set out.

Seed should be sown ½in. deep in rows 12 to 15in. apart and the seedlings subsequently thinned to 4 to 5in. between plants.

Varieties: Crimson Globe, Detroit Dark Red, Crosby's Egyptian, and Obelisk.

Carrots

A late sowing of carrots can be made in early January in the warmer districts. A soil which has been given liberal dressings of organic manure for a previous crop is ideal for carrots, as it will be retentive of moisture and plant nutrients, a most important factor for a sowing during January. Short varieties of carrots are usually grown for early and late crops.

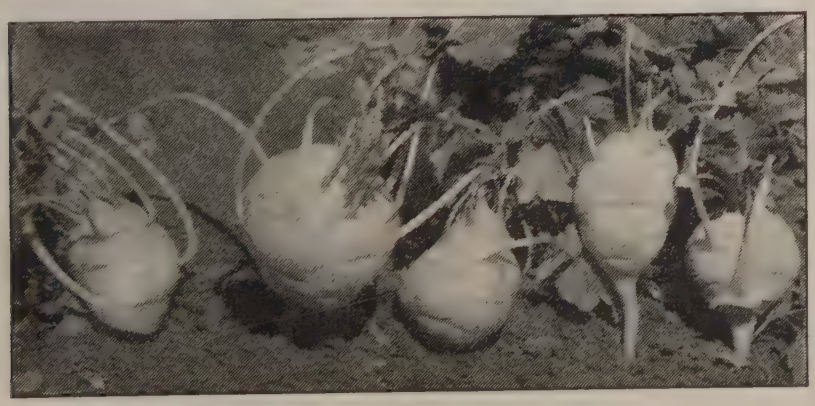
The soil should be worked down to a fine tilth and seed sown ½in. deep in rows 12 to 15in. apart. If seed is sown thinly in well-worked soil, it is very unlikely that thinning will be necessary at this time of year.

Varieties: Early Scarlet Horn, Early Krop, Chantenay, and Nantes.

Celery

Where necessary further plantings of celery may be made in January. Earlier plantings will require spraying, watering, and liquid manuring in the future. An abundance of water is important. Plants grown in trenches are not as likely to suffer from dry conditions as plants set in beds. Applications of liquid manure after heavy watering will be most beneficial. Alternatively side dressings of superphosphate (5 parts) and sulphate of ammonia (1 part) may be applied at monthly intervals from 6 weeks after planting; 2oz. of the mixture should be used to 6ft. of row.

Because of the danger of attack by the principal fungous disease of celery, leaf spot (*Septoria apii*), preventive sprays of Bordeaux powder or a proprietary copper substitute should be applied every 10 to 14 days. If aphides (green flies) are also likely to be troublesome, nicotine sulphate may be combined with either of the fungicides at the rate of 1 fl. oz. (7 teaspoons) to 4 gallons of spray.



[*Sparrow Industrial Pictures Ltd. photo.*

A January sowing of kohl rabi, which resembles an above-ground turnip, is recommended. The fleshy, edible portion is an enlargement of the stem and has the flavour of cabbage and turnip.

Marrow, Pumpkin, Squash, Cucumber

Excessive weed growth should be removed from plantings of marrow, pumpkin, squash, and cucumber. Attention should also be given to watering, liquid manuring, and stopping of the vines.

Liquid manure is of special benefit to vine crops and it can be applied liberally at weekly intervals. Leading growths should be stopped (pinched off) to encourage the growth of laterals, which bear the fruit. The laterals in turn can be stopped to limit the number of fruits to the capacity of the plant or the space available for their growth. Hand pollinating is sometimes advisable, as both male and female flowers are produced separately, and unless it is done, plants are sometimes straggly with fewer, though perhaps larger, fruits, formed mainly at the extremities of the vines.

Vine vegetables required for storage should be allowed to reach full maturity and are better left until the vines start to dry off. The harvesting of some fruits before full maturity will, however, benefit those that remain and keep the vines producing.

Onions

It is important to keep the onion bed free of weeds at this time of year, as dampness is accentuated by weeds around the bulbs and proper ripening off of bulbs is considerably delayed. Earth should be scraped away from bulbs set rather deeply. Care must be taken to avoid injuring them, however, as any damage is likely to impair their keeping quality.

Further manuring or watering of onions will now be unnecessary unless the bed was planted late.

Potatoes

Main-crop potatoes should be kept well moulded up to prevent attacks by

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Never feed them on raw offal

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91

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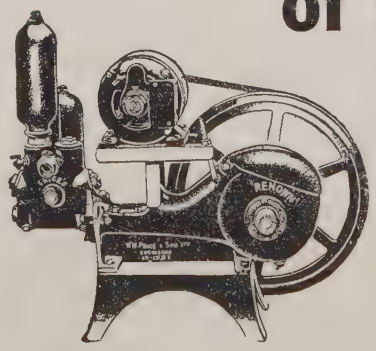

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the potato tuber moth and exposure of the tubers to light, which causes greening. While the top growth is healthy and vigorous tuber development will continue. Early crops are often dug when immature, because they are used almost immediately, but the main crop should be left until the tops are yellow and withered, and at this stage it will be found that the skins of tubers are firm and will not rub off easily. Potatoes may be left in the ground until the foliage dies down, but not longer, because second growth is likely to begin.

Although late plantings of potatoes are not always successful, in districts free from early frosts small plantings of Epicure or Arran Banner could be tried. Dry conditions, very early frosts, or adverse weather may check development of tubers, but the experiment may be considered worth while where space permits or new potatoes are sufficiently prized.

Sweet Corn

The soil should be drawn up to sweet corn to give it support as it grows. Plants exposed to strong winds may need staking. However, cultivation must be shallow, because many of the roots are near the surface. Sweet corn is fairly tolerant of dry conditions, but in an extremely dry season plants will mature a week or two earlier if they are watered occasionally.

Sweet corn has separate male flowers (tassels) and female flowers (ears). Pollination normally takes place as soon as the "silks" appear, and the development of the cob to the edible stage is usually reached 2 to 4 weeks later, according to climatic conditions. When tassels have withered the cobs should be tested by thumbnail pressure; if they yield a milky juice, they are at the correct stage for harvesting.

[Sparrow Industrial Pictures Ltd. photo. Only home gardeners who grow and harvest sweet corn can know it at its best, as they can use it immediately it reaches the correct stage.

Cobs should be harvested by giving them a gentle jerk or by cutting them off with a sharp knife.

To protect the young cobs from attacks by the corn ear worm D.D.T. should be applied as a spray; 1oz. of wettable 50 per cent. powder should be used to 6 gallons of water.

Swedes

In most northern districts January is an appropriate month for sowing swedes. As these vegetables are grown principally for winter use, they must be sown in sufficient time to enable them to reach full development by the end of autumn. Satisfactory crops can be grown on most types of soil used for vegetable production, but best results are obtained on a moderately light loam which contains plenty of organic material. Superphosphate at the rate of 1 to 2oz. a square yard is usually the only fertiliser required on most soils.

If conditions are dry at sowing, it may be advisable to water the soil before sowing or to shade the bed after sowing by spreading light scrim over it. If further watering is necessary, it should be done through the scrim. As soon as germination has begun the covering should be removed. Seed should be sown thinly ½in. deep in rows 12 to 15in. apart and the young plants later thinned 6 to 8in. apart.

Varieties: Popular varieties for the home garden are Laing's Garden (medium), Superlative Table (tankard shaped) and Rutabaga Purple Top (large).

Shallots

Shallots that have not yet reached maturity should be kept weed free to let in air and sunlight. Mature bulbs can be lifted with a fork and laid in clusters to dry for a few days. Bulbs should then be separated and stored in a cool, dry place. Shallots if carefully harvested and properly dried should keep well until the following spring. Some good bulbs may be set aside for next year's crop; those showing damage should be used as soon as possible.

Silver Beet and Spinach Beet

A sowing of silver beet and spinach beet should be made in January to secure plants for transplanting in February. Plantings of both varieties next month will provide greens throughout most of winter if growing conditions in autumn are favourable. The large green leaves of silver beet can be cooked and served like spinach, and the white or cream ribs can be cooked and served like asparagus. Spinach beet when established is more tolerant of adverse conditions than silver beet and it can be harvested over a longer period.

The soil for silver beet and spinach beet should be well drained and well cultivated and where possible rich in humus. If the soil is acid, an application of lime (2 to 3oz. per square yard) will be beneficial. A dressing of 3oz. per square yard of blood and bone or a mixture of 3 parts by weight of superphosphate to 1 part of sulphate of ammonia should be applied and well worked into the soil before sowing or planting.

[Sparrow Industrial Pictures Ltd. photo. Growing potato crops should be kept well earthed up to protect the tubers from the potato tuber moth, which is usually very active during summer. Spraying against possible insect and fungous disease attacks should be continued.

Seed should be sown ½in. deep in rows 15 to 18in. apart. Later young plants can be thinned to or planted out 8in. apart.

Varieties

Silver beet: Giant Lucullus, Fordhook Giant, and Giant Broad White Rib.

Spinach beet: Perpetual Green Leaved and Spinach Beet.

Tomatoes

During January fruit will be setting freely on tomatoes planted in October and November. Regular attention must be given to the removal of all surplus growth and the tying up of the plants.

The tying material should first be made fast to the stake and should pass under a leaf and close to the main stem when encircling the plant, but should not be tied too tightly. Tying plants every 10in. will assist greatly in protecting them against the damaging effects of high winds.

Shallow hoeing should be done regularly.

Application of Bordeaux mixture or suitable Government-certified substitutes at about 14-day intervals is recommended for the prevention of fungous diseases. January is a critical month for the plants, especially if the weather is humid. Where tomato stem borer and looper caterpillar are

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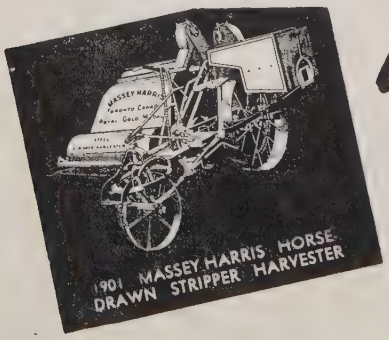

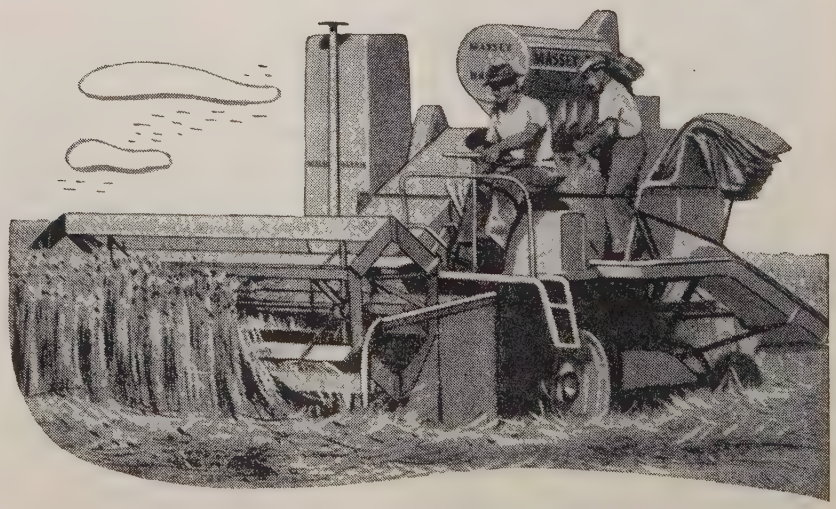

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troublesome arsenate of lead, 2oz. to 4 gallons of water, or D.D.T., ½oz. of 50 per cent. wettable powder to 4 gallons of water, may be used.

Plants should not be forced with manures, although regular applications of liquid animal manure after watering will be beneficial at this time. Steady, balanced growth should be maintained if a good yield of fruit is to be harvested.

Turnips

In most southern districts or where adequate soil moisture can be maintained January is a good time to make a sowing of turnips. Where conditions in January are too dry sowing is often delayed until later in autumn; quick-maturing varieties should be chosen for late sowings. Turnips grow well on most garden soils, but a well-drained, light loam rich in humus is preferable. To produce good-quality roots it is essential for the crop to be grown quickly, and 1 to 2oz. per square yard of superphosphate should give sufficient stimulus.

Soil for turnips should be cultivated to a fine tilth. Seed should be sown thinly ½in. deep in rows 12 to 15in. apart and the plants later thinned 3 to 4in. apart.

Varieties: Early White Milan (matures in approximately 6 weeks), Milan Purple Top (6 to 8 weeks), and Golden Ball, also known as Orange Jelly (9 to 12 weeks). The last variety is especially suitable for autumn sowing, as it usually stands longer than the white kinds under adverse conditions.

[*Photo News Ltd. photo.*

Parsnips should be thinned out early to give each plant sufficient room in which to develop. On the other hand, plants thinned out too heavily produce over-size roots. Parsnips of the size most appreciated by the housewife should be produced by plants 4 to 6in. apart in the rows.

Winter Green Crops

If plants of all varieties of green vegetables for late-autumn and winter maturity have not been set out in their permanent positions, no time should be lost in attending to plantings in January. Puddling of the roots or watering in are the only safe methods to adopt when winter greens are set out at this time of year.

As prolonged dry spells also favour pest development, applications of sprays at 10- to 14-day intervals must be made. The hearts of the plants should always receive special attention. For the treatment of white butterfly and diamond-backed moth caterpillars applications should be made of D.D.T. 2 per cent. dust every 2 weeks or D.D.T. 50 per cent. wettable powder, ½oz. in 4 gallons of water, every 2 or 3 weeks. D.D.T. or arsenate of lead should not be used after 21 days before harvesting. To combat cabbage aphides plants should be sprayed with nicotine sulphate 1 fl. oz. (7 teaspoons) in 4 gallons of water to which 2oz. of soft soap has been added. Nicotine sulphate should be applied during the warmest part of the day and applications should be repeated if aphides reappear.

[*Green and Hahn Photography Ltd. photo.*

Spinach beet or perpetual spinach when established is more tolerant of adverse conditions than spinach and may be picked over a longer period.

Home-made Insecticide

The formula for an insecticide which may be of interest to home gardeners follows. It can be used at various strengths for aphides, scale insects, and also for fleas in buildings and on dogs. It is also very effective for cleaning the hands after they have been soiled with grease when handling machinery, etc.

To one pint of water add 3½lb. of soap, preferably soft soap. Simmer the mixture over a fire and stir it constantly until all lumps have disappeared and a perfectly uniform melt has been obtained. Add 6oz. of refined naphthalene and stir the contents until the naphthalene has dissolved. Remove the mixture from the fire, add 1 pint of kerosene, and stir it until the ingredients are well mixed. The finished product should be semi-solid and uniform in texture.

In the home garden it can be used at a strength of 2oz. to 1 gallon of water for the destruction of aphides on all members of the cabbage family and other plants affected by this pest.

Club Root of Brassicas

Club root has been a troublesome fungous disease for many years. Unfortunately it is still common in home gardens. There is no known method of curing it when it is established, but it can be kept in check by taking measures which disrupt its life cycle. The fungus attacks plants belonging to the cruciferae or brassica family only; for example, cabbages, cauliflowers, brussels sprouts, turnips, swedes, rape, radishes, and mustard, flowers such as alyssum, candytuft, wallflower, and stocks, and weeds such as charlock, wild radish, shepherd's purse, wild turnip and cress. To combat club root and arrest its spread the following practices should be employed:—

1. Prompt destruction of all infected plants, including weeds, preferably by burning, before they rot in the soil.

2. Adequate liming. The disease flourishes on acid soils. If possible, use freshly slaked burnt lime, hydrated lime, or ground quicklime at about 10oz. a square yard on light soil and 1lb. a square yard on heavy soil. The

full benefits of liming are not likely to be apparent for at least 9 to 12 months.

3. Improved aeration of low-lying and poorly drained soil by drainage. Other soils can be improved by the incorporation of well-rotted organic matter, and heavy soils will benefit by the addition of sharp sand, mortar rubble, and sifted burnt clay.

4. Cruciferous crops should not be grown in infected areas for 6 years at least if it is possible. By a long-interval crop rotation it is possible to starve and destroy the vitality of the fungus. The spores are said to live for up to 6 years in the ground even if crucifers have not been growing during that period.

5. Acid manures should not be used. Basic slag and bonedust should replace superphosphate and sulphate of ammonia. Fresh animal manures should not be used.

6. Hygienic cultivation. Care should be taken to wash implements and gumboots in formalin 1 : 50 (about 1 pint to 6 gallons of water) after cultivating a contaminated area and before working on a seed-bed or a new area.

7. Do not plant infected seedlings; examine their roots before planting them out.

8. Seed-bed treatments. The seed-bed, whether in an infected area or not, can be soaked 10 days before sowing with formalin 1 : 50 at the rate of 3½ gallons to a square yard.

Insect Pests and Plant Diseases

Insect Pests

Insects which attack vegetable crops may be classified generally into 4 groups: Chewing insects, sucking insects, boring insects, and underground insects. (The word insect is used here in the general sense, as creatures such as mites, slugs, snails, and millepedes are not members of the order *Insecta.*)

Chewing insects: Some examples of chewing pests are caterpillars, grubs, beetles, weevils, crickets, slugs, and snails. These pests feed by biting off pieces of plant tissue which are then chewed and swallowed.

They are readily controlled by stomach poisons, known as insecticides, or by poison baits—arsenate of lead, hellebore powder, derris dust, metaldehyde, paris green, and sodium fluosilicate, the last three being used for baits. D.D.T., which is not a stomach poison, but causes paralysis and death by contact, has also proved successful in controlling some of the insects in this group.

Sucking insects: This group of pests may be further divided, because of the two different methods they have of extracting the sap of plants, into those which feed by puncturing the plant tissue and then directly sucking up the sap (for example, the large family of aphides, scale insects, and plant bugs) and those which feed by rasping the surface tissue and sucking up the exuding sap (for example, thrips and red mite). As sucking insects do not eat the surface tissues of the plant, they cannot be controlled by stomach poisons. Therefore sprays are used which cause paralysis or suffocation and death by contact—fumigants or contact or smother sprays. Examples are nicotine sulphate, D.D.T., summer and winter oils, pyrethrum powder, kerosene emulsion, derris dust (dual purpose, contact and poison), and lime sulphur (dual purpose, contact and fungicide).

Boring insects: These pests tunnel into the roots, stems, branches, and tubers of plants. Common examples are the potato tuber moth and tomato stem borer. Control is best effected by the use of D.D.T. or arsenate of lead sprays.

Underground insects: This group includes pests such as cutworms, wireworms, grass-grubs, and eelworms, which attack the roots or stems of plants from ground level and below. Control measures include soil sterilisation and the use of poison baits and D.D.T. and arsenate of lead solutions.

Diseases

Most plant diseases are caused by fungi, bacteria, or viruses.

Fungous diseases: Fungous diseases are the most common diseases affecting vegetables and under favourable conditions they reproduce rapidly by means of minute spores, which may be spread by wind or water on the existing host or to other plants. Some examples of fungous diseases of vegetables are late blight on potatoes and tomatoes, mildews on peas, onions, and lettuces, and the various rusts and moulds.

Sprays for the control of fungous diseases, known as fungicides, consist mainly of copper compounds or sulphurs; for example, Bordeaux mixture, Bordeaux substitutes, Burgundy mixture, lime sulphur, colloidal sulphur, flowers of sulphur (powder), potassium sulphide, salicylanilide, and Cheshunt compound.

Bacterial diseases: Bacterial diseases of vegetables are less common than fungous diseases, but several such as bacterial blight of beans (halo blight) and bacterial canker of tomatoes are troublesome at times. Control measures for bacterial diseases include spraying early with copper compounds, the use of clean seed, and the maintenance of good garden hygiene.

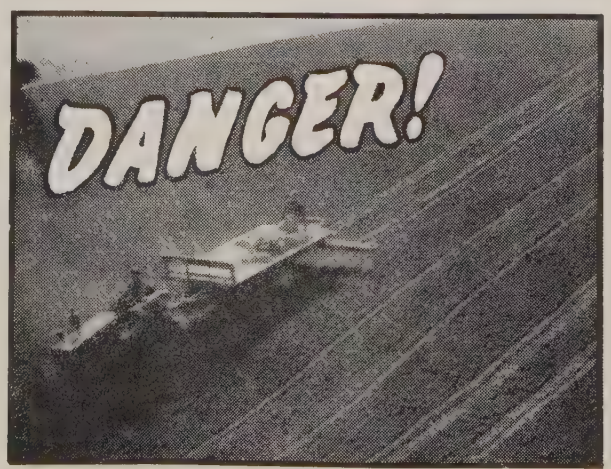
Virus diseases: Virus diseases are unfortunately becoming common on vegetables such as tomatoes, potatoes, lettuces, peas, and cucumbers and other cucurbits. Virus diseases may be described as infective principles in the sap of the plant which may be transferred from an affected plant to a healthy one. Aphides and thrips are common vectors of virus diseases. Some virus diseases may be spread by man through his handling affected plants and then passing on to healthy ones. Virus diseases cannot be controlled directly by spraying, although the spread of those which are carried by insect vectors (aphides and thrips) may be reduced if sprays are used to control the insects. The principal control measures are:—

1. The early detection and removal of affected plants.

2. The use of clean seed and resistant varieties.

3. Hands and garden tools should be washed after handling affected plants.

4. As many common weeds are hosts for virus diseases, all weeds around the garden should be destroyed promptly.



TOPDRESSING can increase production from both flat and hill country, but on hills the dangers of such work are increased. A rolling load behind the tractor may take control, the tractor may not have enough power in the engine or brakes, grass or soil may be wet and slippery because of rain or frost, and wheeled tractors may not have grippers in use.

Points which operators should remember are:—

Maintain control over the tractor and load by using lower gears.

Carry several light loads on a trailer rather than a few heavy ones.

Use the clutch and brakes steadily, not fiercely.

Fasten drawbar pins securely at all times. Snig chains can jolt the trailer operator to the ground and, when the slack has been taken up, pull the trailer over him.

Extend grippers before working on steep, wet, or slippery ground.

Fit grippers in preference to using deep-cutting harrows as a brake behind a topdresser on a light tractor, even though the harrows may be serving a dual purpose.

—J. N. M. WHYTE, Farm Machinery Instructor, Department of Agriculture, Dunedin

Leg Banding Household Poultry for Identification

AN observant household poultry keeper, and especially one interested in the birds, can identify most, if not all, of his few pullets and hens, but too many families show little concern for their fowls beyond expecting them to lay enough eggs for the household, and most people can see no difference between one bird and another. In this month's article W. L. McIver, Poultry Instructor, Department of Agriculture, Hamilton, explains the advantages of being able to identify the fowls and the uses of leg bands.

ALMOST a third of New Zealand's eggs are laid by domestic flocks, and the winter shortage would be greatly aggravated if commercial flocks were the only source. The keen household poultry keeper can obtain an excellent egg yield and frequently his birds have an annual average much greater than those of the commercial farmer.

Competition and Bullying

The chief reason is that the fowls are housed in small units, which reduces bullying. Poultry lay better when penned in units of not more than 40 than in larger numbers, but 40 is too small a unit for the commercial man, who finds his work excessively slowed down by his having to open too many doors. Most farmers run their poultry in pens of 100, some have them in lots of 200 to 400, and a few keep 1000 and more in one large house. In larger units competition between birds is greater, and that alone is a cause of lower egg production, mainly because of the timid birds being prevented from eating all they want.

Irrespective of the size of the unit, a timid fowl which is frequently bullied by flock mates should be culled out no matter how attractive her appearance. She will never be a high producer and is usually a very poor layer.

Even a timid pullet will put up with savage pecks while obtaining enough food to sustain life. She may look one of the neatest birds in the pen, though usually she will be undersized and light. She can appear bright in face colour and comb as long as she gets sufficient food to stimulate her laying organs, but for full stimulation the fowl must eat about a quarter more food than is required merely to keep her alive and healthy. It is the surplus food above the quantity for body maintenance that induces egg production.

[*Niederer Studios photo.*
This spiral type of band is twisted on to the bird's leg.

If suspicion exists that a bird is being bullied, leg banding her with a ring of distinctive colour enables her to be observed.

Profiting by Culling Errors

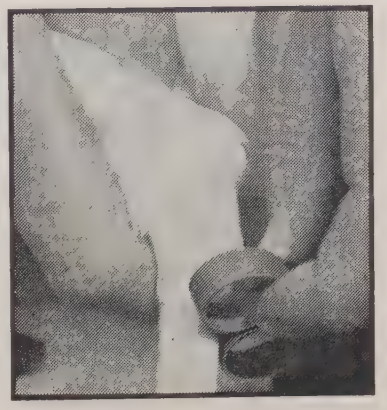
The commercial poultry keeper makes up for reduced egg yield from each bird in large units by better management and culling, and culling is the aspect in which most householders fall short, because they have not the same opportunity for practising. However, if properly interested in learning how to cull efficiently, the householder can readily become proficient, because he has two advantages over the farmer: He has a better opportunity of noting special characteristics of his birds, and, as few fowls need culling out on any one occasion, the family can eat all the culls, which allows him to examine the ovaries while gutting them.

When learning culling the tyro will make mistakes and on occasions, more especially with heavy-breed fowls and cross-breeds, will reject birds that are still laying. The potential cull should be examined carefully for body condition, size and moistness of vent, space between pelvic bones, colour and texture of comb, and, in yellow-shanked varieties, colour of legs. If these features are memorised, they can be reviewed when a fowl is being gutted if it is found that the ovary was still active. Thus opportunity is offered for an immediate review of the circumstantial evidence which caused a wrong decision. The farmer lacks this opportunity because he almost invariably sends his culls to market.

Culling by Identification

Culling is not learnt in a year, and perhaps not even in two or three years to its fullest efficiency. Frequent mistakes might deter a householder from continuing to cull his small flock. The tyro and those not interested in learning much about poultry can cull their fowls with a good degree of efficiency by identification alone. Leg bands are essential for this system, even though pullets are identified by toe-punch marks, which can tell date of hatch, breeder, or breeding strain by holes or cuts in the webbing between the toes.

Two colours of rings are necessary —say, green for merit and red for lack of merit. A watch should be kept for the first of the new pullets to begin laying and a note made of how quickly others of the flock come into lay. The number of eggs laid daily is only a partial guide, as pullets do not lay each day at first. Just before a pullet is due to lay, its comb and wattles will redden, and 10 to 14 days before the first egg is laid the pelvic bones will soften and move to about two finger widths apart; by the time the first egg is laid the pullet will be really red in the comb, the texture of which will be velvety and moist. These are the signs to be used as a guide.



[*Niederer Studios photo.*
The ribbon type of leg band is formed into this shape before being placed on the bird's shank.

If the laying pullet cannot be recognised by comb and pelvic signs, a watch should be kept for birds that sit on the nest long enough to make it certain that they are laying.

When it is judged that a third of the birds are in lay a green ring is put on the left leg of each one laying. When two-thirds of them are laying, a red ring is put on the left leg of the final third that are not laying. At this stage the owner can, if he wishes, ignore laying characteristics until near the end of the laying year.

As each pullet goes off the lay either a red ring is put on the right leg or she is killed for eating until a third of them have been ringed or culled. When it is judged that two-thirds have finished their laying year green rings are put on the final third that are still laying.

At the end of the laying year, when a decision must be made which fowls to reject, the leg bands provide the evidence. All with two red rings should be culled and those with two two green rings kept. The decision about those with one green and one red ring is influenced by the number of hens which can be housed. If more have to be quitted, those with a red band on the right leg and a green on the left should be culled before those with a red ring on the left leg and a green on the right. Usually an early-maturing pullet moults late and a late maturer moults early; early moulting presages poor egg production during the second year.

The same system can be applied to hens. The red and green rings are removed from the pullets being kept and rings of a different colour used to indicate that they are second-year birds. The technical name for a pullet that has gone into the moult at the end of her laying year is a first-year hen. When hens resume laying after the moult the system of green and red leg bands is adopted as for pullets, with the exception that, even if housing space is adequate, it is advisable to cull out every hen that fails to get a green ring on the right leg at the end of her second laying year.

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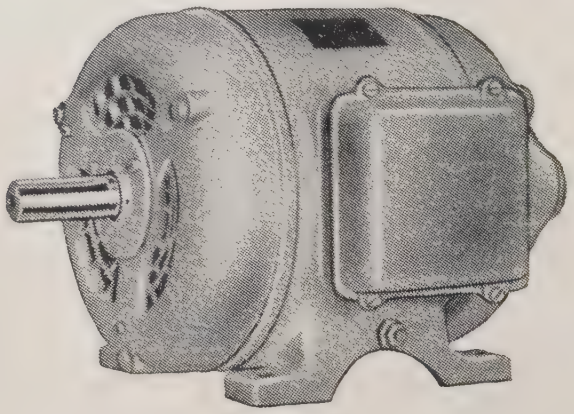

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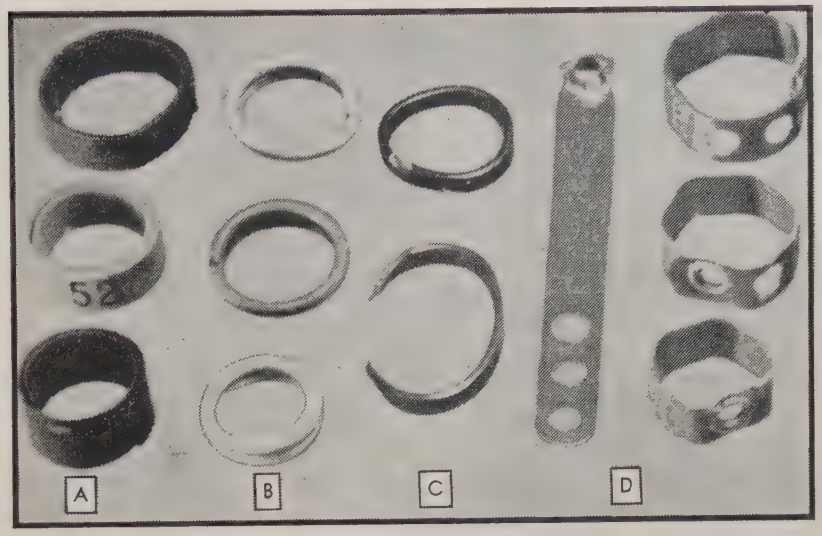
Culling hens merely on age is wrong, and the popular belief that fowls should be kept for 2 years should be disregarded. Each of the two interpretations to be taken from this saying—that all fowls should be kept for 2 years and that none should be retained after 2 years—has only an element of truth. As long as a hen succeeds in getting two green leg bands each year she is worth retaining.

Types of Leg Bands

Leg bands fall into two chief groups. In the upper illustration on this page A and B are of the spiral type, though A is really a coil and the plastic material, because of the width of the ribbon, can be made of more pliable material than B. The rings are made in three sizes: The smallest is suitable only for young growing pullets, the middle size is large enough for all light-breed grown pullets and hens and for most heavy-breed females, and for extra large-shanked heavy-breed females and for all males the largest size is needed. Many people think that pullets stop growing when they begin laying, which is at an average of 6 months of age, but that is not correct; bone growth continues until at least 12 months of age and flesh growth, apart from added weight caused by the putting on of fat, until much later. If too small a ring is put on the shank of a bird that has not finished growing, it will eat into the skin or scales and impair circulation, which causes swelling and finally painful lameness and a suppurating sore.



[*Niederer Studios photo.*

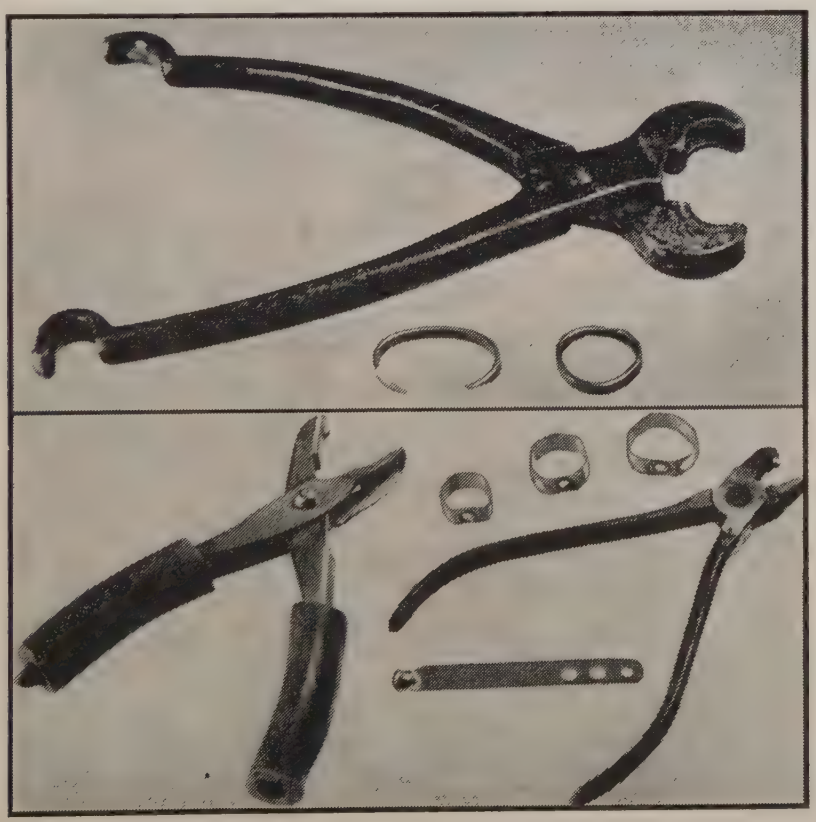
The types of leg band described on this page. A and B are spirals, C is the pig-ring type, and D an adjustable flat metal band.

The style of ring B is also made with three or four coils instead of the one and a half coils illustrated. The multiple-coil rings are better because they can be made of softer material which expands more readily, and thus are easier to put on and take off. The great advantage of the spiral type is that it is made in a number of colours and can be used to identify many factors. Its weakness is that it can catch in wire netting or other small obstacles and the bird, in its struggles to get loose, may pull its leg out of the ring or break the ring. The danger of this happening is greatly reduced by use of the multiple-spiral type of A or B.

The method of putting on both these styles of rings is illustrated on the preceding page. The most important precaution is not to place so much strain on the material that the ring will not fully resume the original shape. A ring of type B is put on by separating one pointed end from the adjacent spiral so that it can be slipped past the back of the leg, then turning the ring until all the spirals have gone on to the shank. The ribbon or broad-band type A is also placed on from the rear of the shank, but is first formed into the shape illustrated.

Leg bands of the other group are made of a rigid metal instead of plastic material and special pliers are needed either to shape and squeeze them or to seal them. Type C is the older-fashioned style of pig ring, but for cheapness, ease of application, permanency, and prevention of injury to the shank it is not surpassed by any other kind of leg band for fowls. The lower illustration on this page shows the groove in the pliers into which the pig ring fits. The two sharp, bevelled ends of the ring are folded over each other by the pliers. The disadvantage of these rings is that they can be taken off only with two pairs of pliers, but this is balanced by their being much cheaper than other kinds.

Type D is adjustable for size and can be sealed. The straight band is shaped to a circle and one of the holes placed over the nipple. The special pliers illustrated have a projection which flattens the raised nipple of the leg band and seals it on so that it can be removed from the bird only by cutting it off. It cannot be used again. As the band is of soft metal, numbering or lettering can be stamped on it.



[*Niederer Studios photos.*

The special pliers needed to apply the pig-ring (upper) and flat metal band (lower) types of leg band.

A wing band is an alternative identification mark to a leg band.

Another type of identifying mark is the wing band illustrated on this page. It has the advantage that it is far more readily discernible on a moving bird than is a leg band.

Uses of Leg Bands

Apart from their usefulness as a culling aid or to indicate age, strain, or source of purchase, leg bands can be used to identify birds that have been broody, sick, or in any respect abnormal. Coloured rings offer advantages in this respect, though metal leg bands will serve the same purpose if they are numbered. Memory should not be relied on to tell that a yellow ring or leg band No. 4, for example, indicates broodiness; a chart on the wall should show for what each colour or number stands.

A leg band is called for if a fowl lays a double-yolked, soft-shelled, or unusually large or small egg. If a bird has a slight bout of illness, she should be marked, but if she does not recover promptly, and especially if considerable weight or sturdiness of breast condition is lost, she can be given no further benefit of doubt; she should be killed and the carcass buried or preferably burnt.

Broodiness should not be tolerated in light-breed strains, but must be accepted as the chief disadvantage of heavy breeds. That does not mean that excessive broodiness in heavy breeds must be accepted; the ideal strain is one that does not become broody in the pullet year, but that is true of only a portion of the best of specially bred strains. Next best is a strain that will not go broody before midspring and will not brood more than once in the year.

Broodiness in heavy breeds and cross-breeds might not be as detrimental to the householder as to the commercial farmer, but it is advisable to know how frequently each bird goes broody. Either an extra ring of the colour indicating broodiness may be added or a metal ring may be nicked with a file. If a pullet goes broody persistently in her first year, she should be culled out. If she goes broody more than three times, she is not worth keeping for a second laying year. Some breeders have developed strains that are much "broody reduced".

If none of a flock of household fowls has gone broody more than twice or three times in the pullet year, and a few more birds must be culled to make space for the new pullets at the beginning of a year, the poorer layers should be rejected first and broodiness then used as the deciding factor, the birds with the lowest records of broodiness being retained.

Leg banding for broodiness does not eliminate the need for a broody coop. This coop is essential where heavy-breed and cross-bred birds are kept. It should be placed immediately above the nests.

☆

SHOW DATES

THE following are dates and venues of A. and P. shows up to the end of March.

1 January—Nuhaka A. and P. at Nuhaka.

*11 and 12 January—Wairoa County A. and P. at Wairoa.

12 January—Blueskin A. and P. at Waitati.

19 January—Central Hawkes Bay A. and P. at Waipukurau.

19 January—Waikouaiti A. and P. at Waikouaiti.

*23 January—Marton District A. and P. at Marton.

25 and 26 January—Horowhenua A. and P. at Levin.

26 January—Waiau A. and P. at Tuatapere.

26 January—Palmerston and Waihemo A. and P. at Palmerston.

29 and 30 January—Feilding I. A. and P. at Feilding.

*1 and 2 February—Buller A. and P. at Westport.

2 February—Clevedon A. and P. at Clevedon.

2 February—Rodney Agricultural Society at Warkworth.

*2 February—Woodville A. and P. at Woodville.

*5 and 6 February—Dannevirke District A. and P. at Dannevirke.

8 February—Dannevirke Ram Fair at Dannevirke.

8 and 9 February—Taranaki Metropolitan A. and P. at New Plymouth.

9 February—Golden Bay A. and P. at Takaka.

9 February—Hukerenui A. and P. at Hukerenui.

9 February—Katikati A. and P. at Katikati.

9 February—North Kaipara Agricultural Association at Paparoa.

*9 February—Pahiatua A. and P. at Pahiatua.

9 February—Waitemata A. and P. at Waiwera.

13 and 14 February—Ohura A. P. H. and I. at Nihoniho.

*15 and 16 February—Franklin A. and P. at Pukekohe.

15 and 16 February—Masterton A. and P. at Masterton.

15 and 16 February—Taumarunui and District A. and P. at Taumarunui.

16 February—Murchison A. and P. at Murchison.

16 February—Rangitikei A. and P. at Taihape.

16 February—Tauranga A. and P. at Tauranga.

20 February—Te Awamutu A. and P. at Te Awamutu.

22 and 23 February—Wellington and Hutt Valley A. and P. at Upper Hutt.

23 February—Banks Peninsula A. and P. at Little River.

23 February—Putaruru District A. and P. at Putaruru.

*23 February—Te Puke A. and P. at Te Puke.

23 February—Waimarino A. P. H. and I. at Raetihi.

*27 February—Opotiki A. and P. at Opotiki.

1 March—Albany A. and P. at Albany.

1 March—Amuri A. and P. at Rotherham.

1 March—Maniototo A. and P. at Ranfurly.

*1 March—Matamata A. and P. at Matamata.

1 March—Mangonui County A. and P. at Kaitaia.

1 March—Temuka and Geraldine A. and P. at Winchester.

1 March—Whakatane and Rangitaiki A. and P. at Whakatane.

3 March—Tokoroa A. and P. at Tokoroa.

5 March—Morrinsville A. and P. at Morrinsville.

*8 March—Waikato Central Agricultural Association at Cambridge.

8 March—Kumeu District A. and H. Society at Kumeu.

8 March—Mt. Benger A. and P. at Roxburgh.

11 March—Lake County A. and P. at Arrowtown.

15 March—Hawkes Bay A. and P. (Autumn Show) at Hastings.

*15 March—Mayfield A. and P. at Mayfield.

15 March—Rotorua A. and P. at Rotorua.

15 March—Upper Clutha A. and P. at Wanaka.

15 March—Wellsford A. and P. at Wellsford.

15 March—Cheviot A. and P. at Cheviot.

*29 March—Hawarden A. and P. at Hawarden.

29 March—Waverley at Waverley.

* The Department of Agriculture exhibit will be staged at this show.

Method of Stacking Rolled Baled Hay

MANY farmers must have been worried at times about their stacks of rolled bales of hay. The idea that such a stack will be unstable and that the bales will tend to roll is far from correct. Once a rolled bale has had time to settle it will not shift. If the string is cut off a bale after it has settled, the bale can be rolled round without coming apart. In this article J. R. Murray, Instructor in Agriculture, Department of Agriculture, Hamilton, describes a method of stacking these bales.

A PROPERLY built stack without stays or supports for the ends will not move once it settles. A few precautions are necessary and the diagrams show clearly the method of building a stack.

Importance of Good Base

The first essential, as in all other stacks, is to provide a good base, with the material used built higher round the outside edges. This counteracts any tendency of the unsupported outside edges of the bales to be flattened. If the diagrams on this page are followed, a good stack will result.

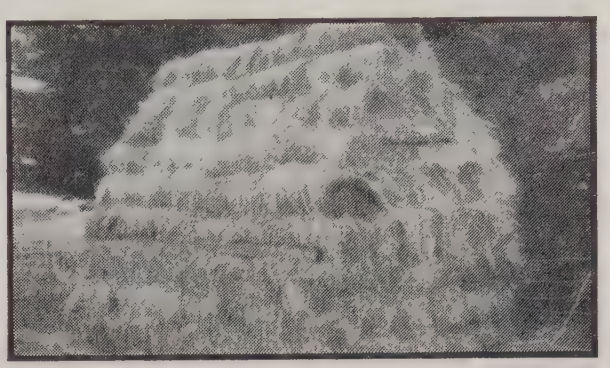


Fig. 2—This stack is of the same type as that in the diagrams but is smaller.

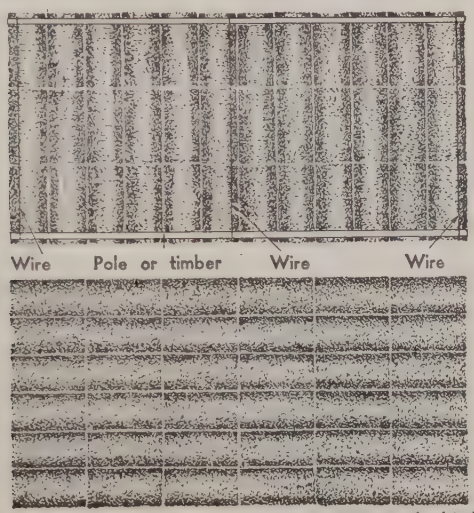


Fig. 1—Plan of stack. Upper: First and third layers. Lower: Second and fourth layers.

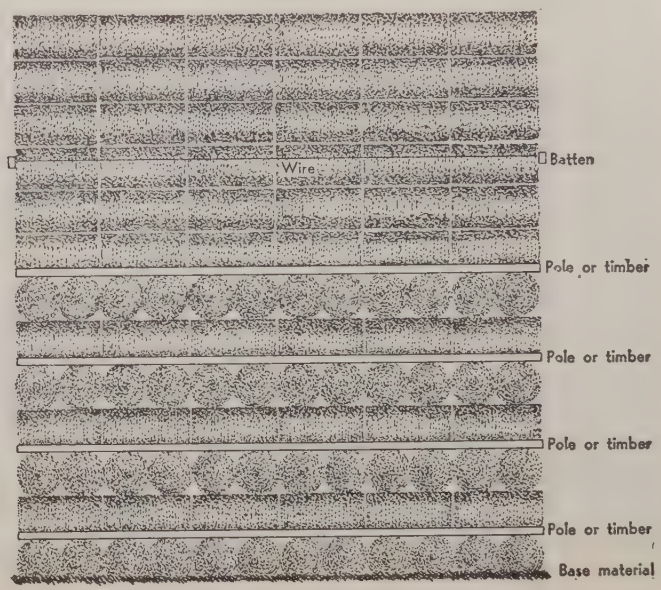


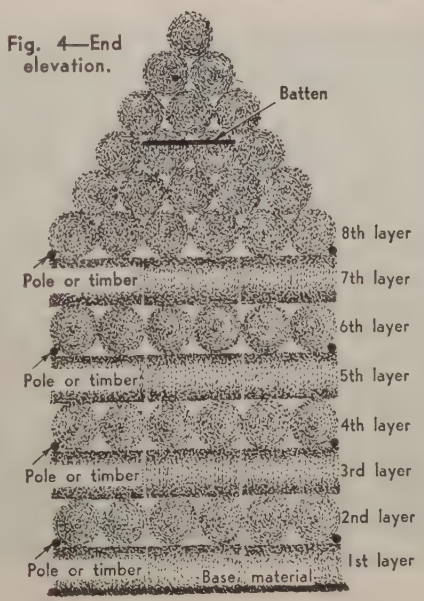
Fig. 3—Side elevation.

The poles or timber can be about the 2in. x 2in. or 3in. x 2in. sizes. The number of wires across the stack will depend on the length of the stack and the thickness of the timber. In small stacks timber need not be wired, as it will sit on the ends of the bales without shifting. When the stack has settled—up to a week or more after it is built—the timber can be removed without causing any harm.

If necessary, other pieces of timber can be laid across the ends of the bales at each end of the stack on top of the 2nd, 4th, and 6th layers to prevent movement of the end bales of the 3rd, 5th, and 7th layers. No wiring is necessary. The timber can be taken out after the stack settles, as the bales will not shift.

As the top bales on the stack top may separate at the ends, a batten or other piece of timber can be placed, as shown in Fig. 4, at each end about half-way up the stack head; the two battens are then wired together. This wiring is all that is necessary also to prevent outward movement of the head toward the ends (see Fig. 3). Stacks without this invariably show an opening-up in the head.

Fig. 4—End elevation.



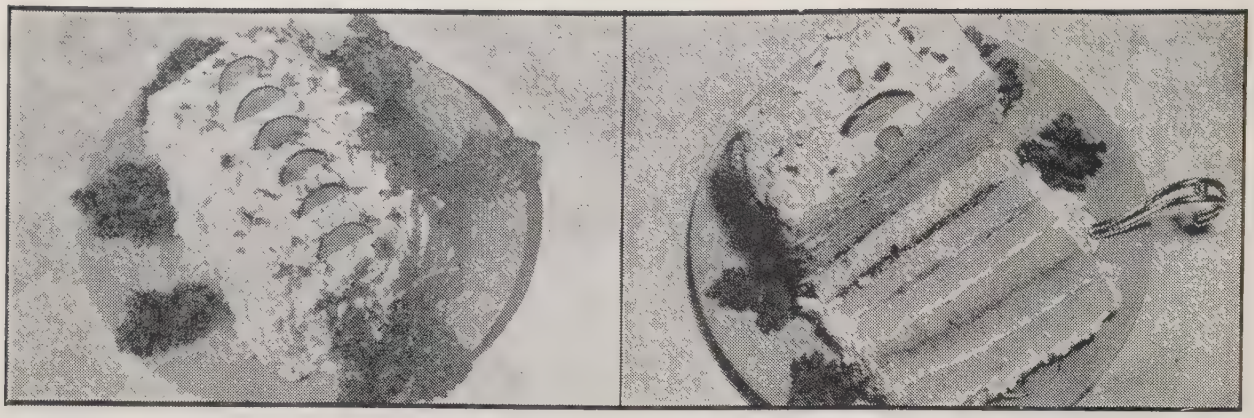
Protection from Rain

The top can be covered in the usual way with extra hay. An alternative and very good method is to cut all strings on the top outside bales and tease out the hay so that it comes down over the next row of bales and so on down to the bottom layer in the stack head. This turns the water off most effectively. There is little fear of the bales, where the string is cut, coming apart; they remain rolled just the same.

For stacks up to 300 bales make the width of the base of the stack equal to the length of three bales placed end to end. If there are more than 300 bales, make the width equal to four bales placed end to end. This method is satisfactory for stacks of up to 600 bales.

Acknowledgment

Acknowledgment is made to Mr. R. E. Till, Waerenga, for his co-operation and the facilities provided in working out this method of stacking.



Cottage Cheese Loaf

THE savoury cottage cheese loaf described below will make an attractive centrepiece for any party. It is simple to make and can be prepared well beforehand. Some of the ingredients used can be the same as those prepared for other savoury fillings. Step-by-step directions for making the loaf are given in this article by Helen Paine, Rural Sociologist, Department of Agriculture, Wellington. The ingredients of the loaf are a 2lb. sandwich loaf, ¾lb. of cottage cheese, ¼ pint of cream, 4 or 5 savoury fillings, and parsley, tomato, radish, or any other garnish.

MAKING cottage cheese is essentially the process of draining off the whey from sour milk. The curd may take a long time to form, especially in cold weather, but the process can be speeded up by adding salt to the sour milk and then warming it very gently to blood heat. If the heat is too great, a tough, dry curd forms instead of the smooth, soft-textured type that results from natural souring.

When the curd has begun to separate from the whey the milk is strained through butter muslin. Line a colander or wire strainer with butter muslin and tip the milk into it. When most of the whey has separated from the curd place a saucer and a heavy weight on the cheese and leave it to drain over a basin. The cheese is ready for use in 12 hours or slightly less. A pint of milk makes about 4oz. of cottage cheese.

The fillings for the loaf may be made from any savoury mixtures with blending flavours. A great variety of savoury spreads can be made from the basic ingredients, which can be divided into three categories.

Savoury Butters

Savoury butter mixtures, suitable for spreading, are made by adding some piquant flavour to softened creamed butter. Chives, mustard and cress, onion juice, tomato sauce, curry powder, or fish paste would all be suitable.

Spreads

Meat, vegetables, fish, or egg can be minced or mashed and seasoned with chutney, mustard, Worcestershire sauce, mayonnaise, peanut butter, onion, herbs, or other suitable flavourings.

Fillings

More substantial fillings can be made by adding a variety of flavours to a base of thick white sauce made from 4 tablespoons of flour, 4 tablespoons of butter, 1 cup of milk, and salt and pepper. Grated cheese, oysters, cooked mushrooms, and fish paste are all successful flavours used in these fillings.

The finished loaf is garnished with chopped parsley, or chives, and slices of tomato or radish or wedges of a red-skinned apple.

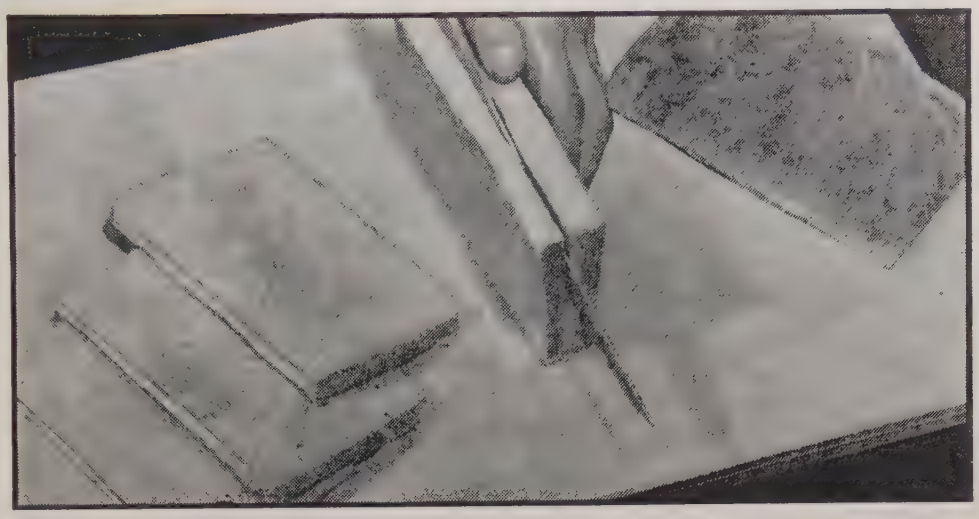
When the loaf is served it should be cut across in thick slices, and if smaller portions are wanted, it can be cut down the centre as well. Small plates and forks should be provided with the servings.

The fillings for the loaf. 1. An egg and cheese savoury mixture seasoned with chives. 2. A meat spread made from cold corned beef and tomato sauce. 3. A filling made from cooked mushrooms and thick white sauce. 4. Tomatoes. 5. Mixture of mashed carrots and peanut butter.

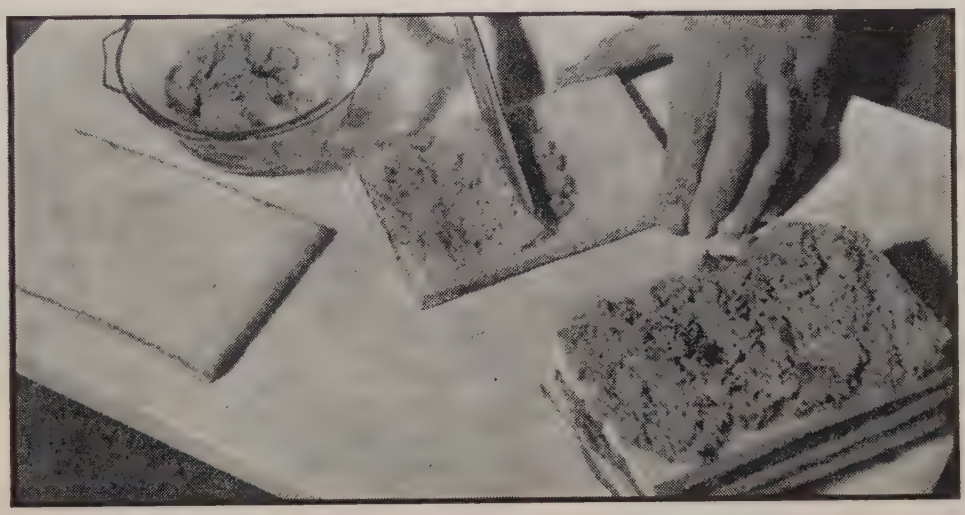
The cottage cheese (6) is mixed to a spreading consistency with the cream. If the cheese is very dry, it may be necessary to add a little milk to make it easier to handle.

If the loaf is being made for a party, the mixtures left over from filling pastry cases or sandwiches can easily be used up in it.

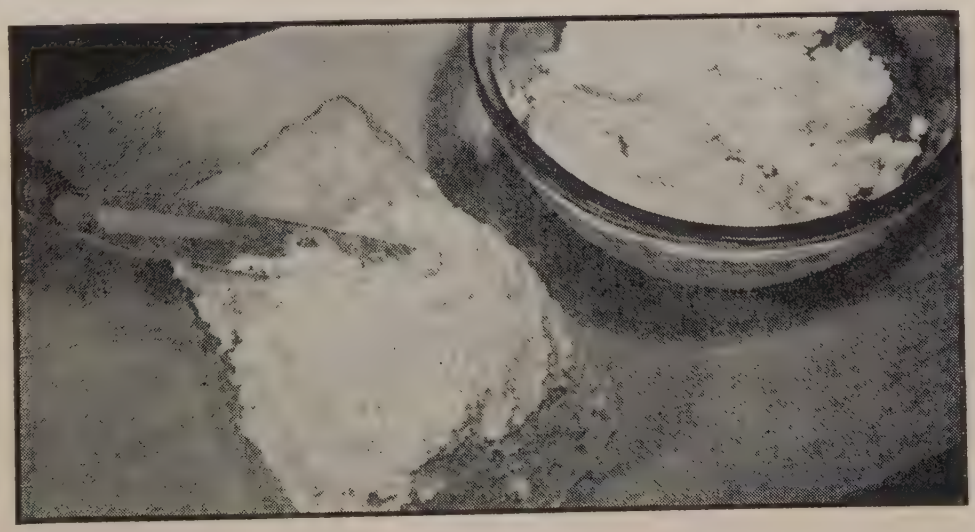
The crusts are cut off a day-old 2lb. sandwich loaf and the bread is sliced lengthwise into five even slices about ½in. thick. The most suitable knife to use is not a bread knife, but a good sharp long-bladed kitchen knife. When the five slices have been cut stack them one on top of the other and trim them so that the top slices are slightly smaller, grading down to the larger ones at the bottom. This is not essential, but it makes the final spreading of the creamed cheese much easier.



Spread a generous layer of butter on one side of the top and bottom slices of bread and on both sides of the slices in between. Spread the bottom slice first with any filling and then spread the next slice and place it lightly on the first. Do not press it down firmly, because the filling should be spread thickly on the bread and not forced out at the sides. Continue spreading the slices and stacking them to re-form the loaf. If tomatoes are used in the loaf, they should be placed in slices between the two layers of a spread so that they do not moisten the bread.



When the last slice is placed on top shape the loaf gently with the hands, being careful not to press it down until all the sides are even. Trim the loaf if necessary and remove any filling which may have oozed out. Using a broad spatula, coat the loaf with the cottage cheese mixture. The process is similar to icing a cake, though the cheese should not be smoothed over, but left in rough points and swirls. Put the loaf aside in a cool place, because it cuts better if it is chilled before serving. Then it should be removed to a large plate or small meat dish and garnished.



WOOL for BABY CLOTHES

FROM the first few minutes of life babies are entrusted to the care and comfort of wool. Only wool, Nature's own clothing, can give the unfailing protection essential in the early days when resistance to colds and infection is at its lowest. Wool is the "clothing of delight" immortalised by Blake in his poem "The Lamb", and baby wool is the softest and purest wool of all. Lambs' wool, the first and finest clip, may be taken from the young sheep at about the age of 8 months.

BABIES must be kept at an even temperature and should never wear more clothes than are just sufficient. Wool provides warmth without bulk, for much of its warmth is the result of the air held in its loose, cellular weave. This air provides healthy, natural protection, keeping in the body warmth and keeping out cold.

Wool is as soft as down, and brings great contentment to tender baby skin. Perspiration moisture is absorbed naturally into the depths of the fibre, so that the wool never becomes damp, chilly, or uncomfortable. This natural virtue of wool means much to a baby's comfort and is an essential protection against chills.

Wool garments fit snugly but loosely, leaving plenty of room to kick in, because of wool's natural elasticity, which ensures a perfect fit and prevents clothing from clinging too tightly. The elasticity of wool is a big help when a baby's clothes are being put on or taken off. When a

baby starts crawling clothes simply must wear well, and fortunately there is plenty of good strong wear in wool's supple threads.

Washing Baby Clothes

A baby's wool clothes must be washed often, and it is important that they stay as comfortable and soft as new. Wool is easy to wash and, handled carefully, will retain all its natural qualities for a remarkably long time. Here are some hints on washing baby clothes:—

1. Wash garments regularly as soon as they become soiled.

2. Use fresh water, at about elbow temperature, and mild soap suds.

3. Squeeze, do not rub or wring.

4. Rinse thoroughly.

5. Dry clothes at once, laying knitted garments flat, and pulling them gently to their original shape and measurement.

6. Do not dry woollen garments near a fire.

7. Knitted garments are best not ironed.

8. Outer garments washed less frequently can be kept fresh by brushing them with a soft, clean brush.

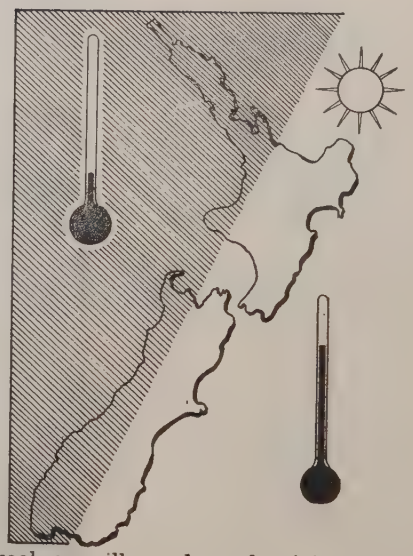
What the Experts Say

Experts on baby welfare all insist on wool for babies. The Plunket Society of New Zealand writes:—

"In New Zealand's long, narrow islands considerable variations in temperature exist at all times of the year, and all Plunket and Karitane nurses know that, apart from seasonal changes, sudden changes of temperature are almost commonplace, giving rise to the maxim 'Clothe by the temperature and not by the season.'

"The society's handbook 'Modern Mothercraft' states that a baby's clothing should be 'light, loose, warm.' All these attributes are supplied by wool, but to meet climatic conditions suggested requirements for infants' wardrobes are varied to meet the needs of the far north and the far south. In winter all wear some wool; in midsummer the northern infant, other than the newly born, probably has a pure-wool pullover or cardigan as its sole woollen garment.

"However, for average winter wear the following wardrobe would be found in nearly every home in which there is a baby: Hand-knitted vests of



wool or silk and wool; nightgowns, petticoats, and matinee jackets of flannel or wool and cotton mixture (mixtures containing at least half wool are advocated); knitted jackets, frocks, bootees, gloves, and pilchers. Many mothers prefer a neatly-tailored type of pilcher made from two thicknesses of flannel. All winter babies should possess knitted suits of pure wool consisting of breechettes and matching top. In a New Zealand baby's cot will be found an enveloping pure wool blanket, small top blanket, and a 'cuddly' blanket. In an institution the last perforce will be a boilable processed cotton, but in the home it is ideally made of wool and cotton mixture, which is advised also for bottom blanket and drawsheets. A baby's woollen outfit is completed by a shawl for best and a small carrying blanket or wrap for household use.

"In winter New Zealand pre-school children continue to wear woven woollen vests, and shirts, pants, frocks, and knickers are made of woollen mixture. Their outdoor garments are also made of woollen cloth."

Hedge Species for the Flower Garden

MANY visitors to Great Britain have been impressed by the use of hedges in that country and by the general attractiveness and impression of neatness and completeness lent to the landscape by hedge-bounded fields; the same cannot be said of the general landscape in New Zealand, possibly because there is much less variation in the types of hedges generally used in this country. In this month's article for the flower gardener C. K. Ellis, Horticulturist, Department of Agriculture, Dunedin, discusses the use of hedges and a number of hedge types not commonly cultivated in New Zealand.

[*N. W. Deverell photo.*

WHERE an enthusiastic gardener has created attractive surroundings for his house and his neighbour has less enthusiasm for gardening, a hedge is essential to avoid jarring of the eye. A hedge on the roadline gives privacy and can obscure unsightly objects on or beyond the road. By sensible control of the height of a hedge unwanted objects in the foreground can be obscured and the view beyond left unobstructed—often a very useful effect in country areas. Boxing-in effects must at all costs be avoided, and this condition is sometimes created when a lawn has hedge plants around three or four sides. Hedges, especially evergreens, may be planted in proximity to lawns and borders, for they create a satisfactory background for colourful flowers and other objects in front of them.

On suburban properties general-purpose hedges are usually most desirable, but on large properties a wide variety of hedges may be used for special features, such as attractive foliage, bark, or blossom. They can be kept trimmed or untrimmed, and taller-growing species may be used as shelter belts.

A pleasing vista from the house should not be obstructed by a hedge unless shelter from winds is more important than the view. Wherever possible a hedge should appear to be running from one object to another; that is, the ends should not be in open spaces. If that cannot be avoided, a great improvement can be made by planting a small clump of trees or perhaps one large evergreen specimen at the open end of the hedge. All hedges should be allowed an abundance of light on all sides to encourage satisfactory development of foliage.

Planting of Hedges

On very light or poor soil or on stiff clay results are more likely to be good if some of the undesirable type of soil is removed and replaced with a good loam. Good drainage is essential for hedges, like most other plants, do not normally tolerate "wet feet".

Each plant should be set in the soil so that the old nursery mark is about 1in. below the final soil surface. For most species the plants should be between 1 and 3ft. high at the time of planting, the smaller size being preferable because it facilitates keeping them clothed with branches to the ground.

Most species are placed from 15 to 18in. apart. Expense can be saved by wider spacing, but a good hedge will then take much longer to form, and another disadvantage is that if a single plant should die, it leaves a very wide gap which takes a considerable time to fill. Early-spring planting is the most satisfactory under New Zealand conditions for most species, especially evergreens.

Where very large plants are used pruning them all to the same height is useless, for doing so makes it very difficult for the plants to form a fully clothed hedge. Large plants should be pruned to within a foot of the ground immediately after they have been planted.

Trimming of Hedges

The time hedges are trimmed seems to make little difference to the health of the plants. In general, hedges which are trimmed in spring before growth starts and grow unevenly during the season should be pruned again in autumn, because they become rather untidy. Probably the most satisfactory time is shortly after midsummer when most of the new growth has been made. After this clipping hedges make only very short growth, which normally is just sufficient to cover the wounds and bare twigs left after cutting. This leaves the hedge with a neat, well-clothed appearance for the rest of the season—10 or 11 months of the year.

Shapes of Hedges

Shape is largely a matter of taste. One of the best shapes for retaining thick growth at the bottom of the hedge is a triangle, broad at the base and rising to a comparatively narrow ridge at the top. Some species are quite satisfactory when given a rectangular shape with a broad, flat top. This can be varied to the type with a rounded top.

It is most important that the broadest part of the hedge be at the base, regardless of the form the hedge takes above it.

If too much growth is left on the hedge at each trimming, its width will grow enormously in a very few years; for example, 1in. of extra growth left on each season means an increase of 2in. in width every year. If 2in. were left each year, the hedge would gain 4in. in width, and such a rate of increase would give a hedge with a base width of about 8ft. in 25 years.

Patience must be exercised about increasing the width of a hedge, for it will be thicker and easier to control if it is cut back severely in the first few years of its growth while being trimmed into the desired shape. Most deciduous hedges can be cut back severely when they become too wide, but few evergreen species can be treated in this way, for if too many branches are exposed, they fail to become clothed with foliage again and ultimately die, leaving an unsightly, gappy hedge.

Cultivation of Hedges

Hedges undoubtedly thrive better where the soil is cultivated and kept free from weeds to a width of about 2ft. on either side of them. Occasional topdressing of well-rotted animal

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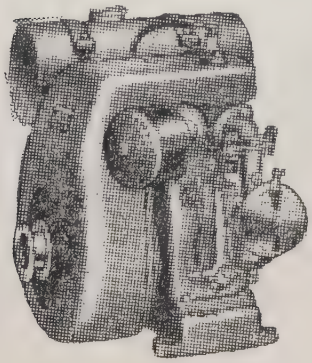

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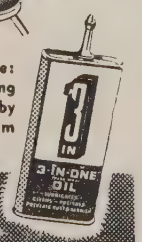

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Sift together flour, sugar, salt and baking powder, then rub in the potato. Add sufficient liquid (about a pint) to make a soft and smooth dough. Mix quickly, put at once into a greased tin ¾ full, smooth top with a knife dipped in melted butter, and bake immediately about ¾ to 1 hour in a hot oven (400 deg. F.). Cover over with paper for first 10 or 15 minutes to prevent crusting too soon. When done, take from tin and wrap in a bread cloth until cold.

This Recipe Is Inserted To Help New Zealand Housewives By T. J. Edmonds Ltd., Christchurch, Manufacturers of Edmonds 'Sure-to-rise' and 'Acto' Baking Powders. 9.1

manures or complete fertilisers are beneficial, especially if the soil is light.

Recommended Hedge Species

The following list contains a variety of species which can be used to make attractive and long-lived hedges:—

Deciduous Species

Acer campestre (hedge maple) makes a good close hedge with branches to the ground. It has attractive foliage.

Acer negundo makes a good hedge, but is a strong grower and needs frequent trimming. It is probably best as a tall hedge.

Berberis thunbergi (Japanese barberry) forms a very satisfactory low-growing deciduous hedge which will reach a height of 4ft. without difficulty. It is of compact habit, has small, attractive leaves, and is firm enough to retain its shape well. The leaves are slightly coloured during autumn and their fall is less disappointing than is usual with other deciduous species, for a profusion of scarlet berries is left during early winter. The amount of fruit is much reduced when the hedge is clipped hard, but because of its comparatively dwarf nature it can frequently be left growing fairly strongly without being trimmed.

Berberis thunbergi atropurpurea has all the good points of the Japanese barberry and has attractive purplish leaves.

Betula lutea (yellow birch) makes a good firm hedge and stands hard cutting well. It retains live branches right to the ground, but the foliage is somewhat coarse for an attractive ornamental hedge.

Betula nigra (river birch) is probably the best of the *Betula* species for hedges. It remains clothed with foliage to the ground and is stiff in habit, though perhaps not as close as might be desirable.

Caragana arborescens (Siberian pea tree) will remain for many years fully clothed with branches to the ground and in excellent condition throughout. It is probably the best tall deciduous hedge for colder climates and will resist drought and cold. It grows fairly rapidly and has attractive green leaves. Nearly all its growth is made early in the season and a midsummer trimming is sufficient. It will reach, if required, a height of 18ft. and prefers full sunlight, for in shady positions it tends to become open at the bottom.

Carpinus betulus (hornbeam) has a compact, firm, spreading habit with branches close to the ground and can be considered one of the most satisfactory of the deciduous hedges.

Cornus stolonifera flaviramea (goldenbark dogwood) is excellent as a conspicuous hedge for the dormant season, its yellow bark being extremely useful in landscape planting. It stands trimming well.

Fagus americana (American beech) makes a good firm hedge and normally is clothed to the ground with living branches. The foliage is not as attractive as that of the European beech.

Larix europaea (European larch) makes a satisfactory hedge except in the severest of climates. It is compact, well clothed with branches to the ground, and exceptionally attractive when the leaves are bursting in early spring.

Physocarpus opulifolius aureus (goldleaf nine bark) is a strong grower and rapidly makes a large hedge where one is desired. The foliage is a little coarse, but the species makes a good tall, yellow-leaved hedge which retains its foliage to the ground.

A well-trimmed barberry hedge, thick at the base, provides good shelter and is stock proof.

Populus nigra italica (Lombardy poplar) is not satisfactory for a permanent trimmed hedge, though as a deciduous tall windbreak it is probably unsurpassed.

Prunus grayana (Japanese bird cherry) makes a fairly good though coarser-foliaged hedge.

Quercus imbricaria (shingle oak) makes a very attractive hedge, having entire glossy leaves rather suggestive of laurel and being well clothed to the ground. Its leaves are held until well into winter.

Salix pentandra (laurel willow) makes an excellent glossy-leaved hedge, but tends to become infected with the yellow gall and thus become unsightly.

Syringa josikaea (Hungarian lilac) is very hardy and is almost the only member of the *Syringa genus* which will make an attractive trimmed hedge. The foliage is glossy green and the plant is remarkably free from diseases and pests. It remains well clothed with branches to the ground. It is probably one of the finest of hedges.

Viburnum lantana is excellent as a taller hedge and remains for many years in first-class condition. Its growth is close and branches are retained to the ground. The foliage is attractive and remains on the plants longer than on most deciduous species.

Evergreen Species

Abies balsamea (balsam fir) makes a good close hedge which stands trimming well and can be kept to a height of about 4ft. The foliage is very attractive.

Picea canadensis (white spruce) may be kept at little more than 4ft. in height for many years and remains well clothed with branches to the ground.

Picea excelsa (Norway spruce) makes a good, compact hedge, but tends to become rather large and exceptionally broad at the base.

Picea pungens kosteriana (Koster's blue spruce) makes a very satisfactory hedge when 5 or 6ft. high, and its steely-blue colour makes it one of the most attractive of evergreen species. It may not be as long lived as some hedges, as specimen trees of this blue spruce seldom live much longer than 35 years.

Pinus strobus makes a most attractive and most satisfactory hedge which remains clothed to the ground throughout its long life. It has soft, light-green foliage and is very striking in appearance. It is native to North America and is known there as the white pine.

Pseudotsuga taxifolia (Douglas fir) may be kept at a height of between 5 and 8ft. for about 50 years in quite satisfactory condition. It makes an attractive hedge and withstands trimming very well.

Taxus cuspidata (Japanese yew) grows very slowly and may be kept at a height of as little as 2ft. for up to 30 years. It is not always clothed completely to the ground.

Thuja occidentalis (American arbor-vitae) forms a hedge which may be kept at about 6ft. high throughout a normal lifetime. It is undoubtedly one of the best evergreen hedges. It stands trimming well, will endure a certain amount of shade, and is only a moderate grower, requiring much less cutting than most other coniferous species. It will succeed in a wide variety of soils, is very hardy, and has the added advantage that it is readily transplanted.

Thuja occidentalis wareana (Siberian arbor-vitae) may be kept to about 4ft. high for many years and makes almost as good a hedge as *Thuja occidentalis*, but the foliage is a much deeper green and perhaps a little more attractive.

Thuja canadensis (Canada hemlock) is a slow grower which ultimately makes an excellent hedge and remains in perfect condition for 40 or 50 years. Normally it is well clothed to the ground with living branches. Its leaves are small, bright green, and very attractive.

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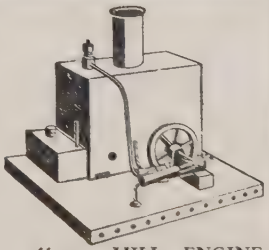

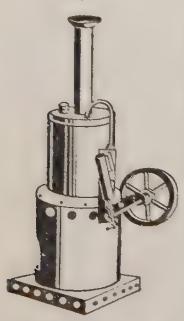

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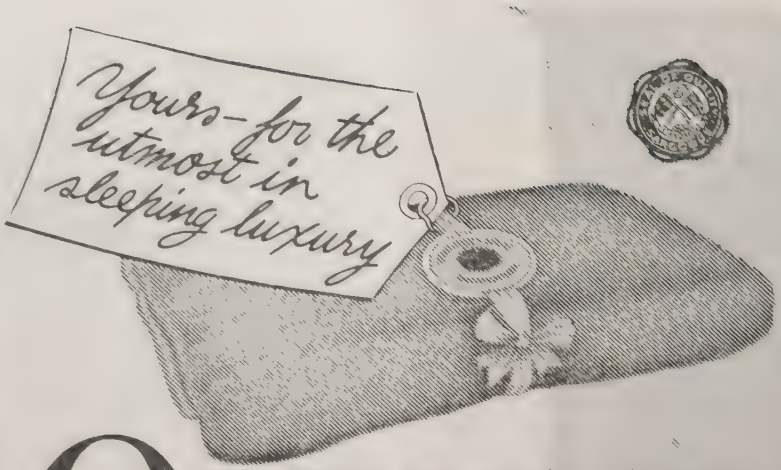

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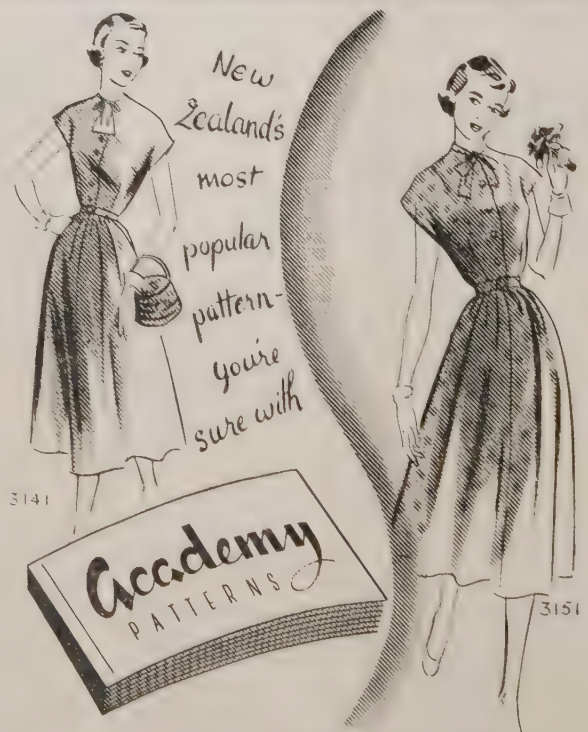

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Dahlias grown for show blooms may need to be fed with weak liquid manure, but such feeding is not necessary for plants grown for normal border display.

Biennial plants such as wallflowers, sweet williams, and myosotis may be raised from seed sown during January in partly shaded places in the warmest districts. The seedlings should be pricked out a few inches apart in nursery beds where they can develop well and be ready for planting into the borders for next season's flowering.

Bulb planting will begin in the earlier districts in February and the gardener should now be giving some thought to types and varieties to buy. The best stocks are always sold rapidly at the beginning of the planting season. If the bulbs must be stored for a while before being planted, they should be kept in a cool and dry place.

Chrysanthemums will be growing strongly by January and attention should be given to staking and tying them. As soon as the clump of shoots is well developed a tie should be made right round the plant to prevent the small side branches being blown off by winds. Late-flowering varieties should be stopped again by pinching the tips out of the shoots; this encourages branching and a greater number of flowers.

Compost, when it is well matured, should be worked into the ground at regular intervals. It is very valuable in improving the texture and water-holding capacity of the soil. The material should be sieved through a ½in. riddle and the coarse parts returned to the heap for further rotting. The fine material should be spread evenly over the borders and forked in lightly.

Cuttings of a great variety of herbaceous plants and shrubs can be taken in January and rooted in a cold frame or under a bell jar in the open provided it is in a shady situation. An inverted glass jar or a box without top or bottom and with a sheet of glass over it probably serves just as well. The objective with soft cuttings is to prevent wilting during the first few days after their insertion in the rooting medium (usually soil), and this is achieved by maintaining high humidity in the cold frame or cover. A few of the plants which can be propagated in this way are sweet williams, pentstemons, antirrhinums, hybrid wallflowers, perpetual-flowering carnations, and many shrubs, including buddleias, salvias, conifers, and hydrangeas.

[*Douglas Elliott photo.*

Cyclamen are extremely useful winter-flowering pot plants for the house.

[*Douglas Elliott photo.*

Kniphofias grow comparatively well in poor soils in fairly dry situations. They are excellent decorative plants and respond well to division every third year.

Cyclamen are extremely useful winter-flowering pot plants for the house and are not hard to grow. However, the raising of good plants from seed requires about 18 months. The home gardener is advised to buy a plant in bloom from a reliable seedsman. After the flowers have faded in spring the plant should be dried off gradually and allowed to rest in a cool place outside until January, when it is started into growth again by knocking it out of the pot with its ball of soil and repotting it. During the repotting, most of the old soil should be knocked off and replaced with fresh potting soil. Plenty of crocks should be placed in the bottom of the pot to ensure good drainage. The corm is set almost on top of the soil, only its basal part being buried. Flowers of sulphur sprinkled over the top of the corm reduce the tendency to rot. The plants should then be watered thoroughly and stood in a cool, shady place to await signs of growth.

Dahlias grown for show blooms may need to be fed with weak liquid manure. It is not necessary to feed plants grown for normal border displays, as these should succeed quite well if the soil has been properly prepared.

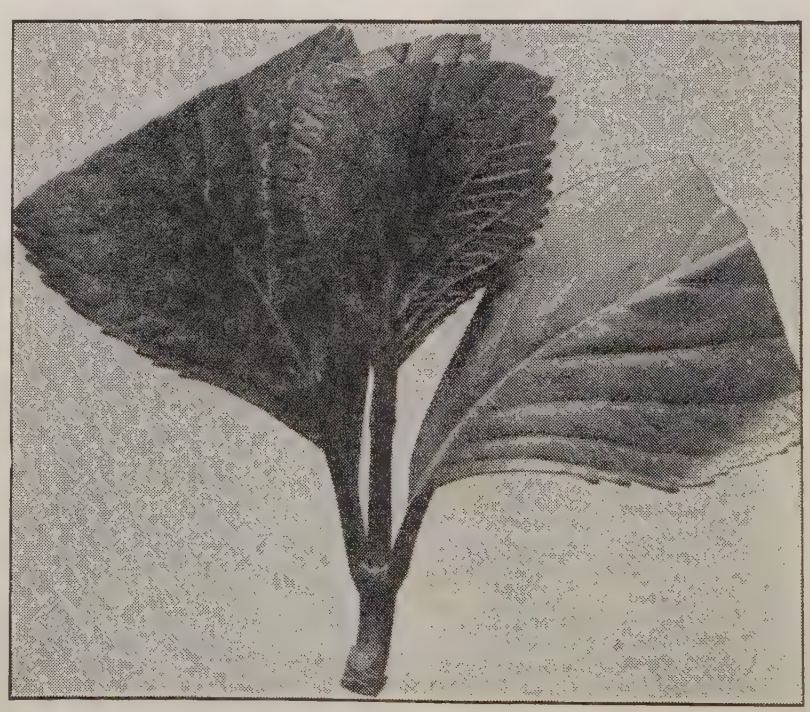
Freesias are excellent pot plants for the house during winter. A 4in. pot may contain 8 or 10 bulbs. A good potting mixture consists of 7 parts by bulk of loam, 3 parts of peat or leaf mould, and 2 parts of sharp sand, to each bushel of which is added 1½oz. of dried blood, 1½oz. of superphosphate, ½oz. of sulphate of potash, and ¾oz. of carbonate of lime. When the pots have been filled they should be plunged into the soil in a cool part of the garden and watered thoroughly. A covering of ashes or light soil about an inch deep should be spread over the top of the plunged pots. When the shoots appear above the covering the pots should be removed and cleaned and taken to a sunny position in the house where the freesias will bloom.

Gaillardias bloom freely and make a bright show, especially in hot, dry weather and in poor soils where few other flowers will flourish. Seed of these plants can be sown in January and the seedlings later transplanted to warm, well-drained, sunny sites in the border. Gaillardias can be multiplied by digging the plants in autumn and cutting the fleshy roots into pieces about 2in. long; the end of the cutting nearest the crown should be cut off squarely; if the cuttings are placed upright about 3in. apart in sandy soil with the square ends slightly below the surface, by spring they will have developed roots and buds and may be transplanted to the borders in the usual way.

Herbaceous perennials in the borders should be staked securely as soon as necessary. The criterion of good staking is a garden undamaged after a gale, yet with few strings and ties showing. Plants with massive and heavy flower heads, such as lilies, will grow unsupported for a considerable time, but should be staked securely by the time the flower buds appear.

Hollyhocks can be used effectively near the house to break the lines of bare walls. Plants are best raised from seed sown each year during summer, because young plants are less susceptible than old plants to attacks by rust fungi. In an old, infected plant the rust spores persist from year to year round the crown at the base. If the leaves show the typical brown spots of rust, they should be sprayed at once with a spray containing 2 fl. oz. of lime sulphur and ½oz. of colloidal sulphur to 2 gallons of water. If the plants are near a painted wall, the paintwork should be protected with newspapers or a cloth while spraying proceeds, for sulphur will discolour the paint.

Hydrangeas root readily from cuttings taken from the new shoots at this time of year. Each cutting should be cut off neatly immediately below a bud 3 or 4in. from the tip and inserted in sand in a cold frame. They should be well watered and covered with a



Hydrangeas root readily from cuttings taken from the new shoots at this time of year. This is how a cutting should appear when ready for insertion in the rooting medium. The bottom few leaves may be removed from each cutting for convenience in handling.

sheet of paper to prevent the entry of bright sunlight, and the atmosphere within the frame should be constantly moist.

Iceland poppies may be planted in January, though recent experience has shown that plantings made in February and March are less susceptible to spotted wilt attacks. Seed may be sown in January in boxes kept in a shady position and covered with paper until the seedlings are showing through the soil. As soon as the seedlings are big enough to be handled they should be pricked out about 2in. apart in boxes and later planted into a well-limed bed which has not been manured recently. Plantings made at this time of year will flower late next winter.

Kniphofias, popularly known as red-hot pokers or torch lilies, flower during summer and autumn. They will succeed in comparatively poor soils and dry situations, though they are most frequently planted near pools. They respond well to cultivation and regular dividing every third year.

Lawns should be given their quarterly dressing of fertiliser if the weather is not too dry. If grass growth has ceased through drought and the lawns are brown, the feeding should be delayed, as the fertiliser tends to delay recovery of the grasses. The dressing consists of 3 parts of sulphate of ammonia, 1 part of superphosphate, and 1 part of sulphate of iron applied at 1oz. per square yard.

Meconopsis betonicifolia (Himalayan blue poppy) thrives in well-shaded places in the cooler parts of New Zealand and makes an attractive summer display among shrubs and trees. The plants should never be allowed to suffer from drought. The seeds germinate best if sown immediately after ripening, which occurs about January and February. They should be sown in boxes or pots in a shady position and be planted out as soon as the seedlings are large enough.

Peonies are herbaceous plants which normally flower in early summer. They should not be moved more than necessary once they have become established, for they take a season or two to recover, but evergreen clumps many years old should be lifted and divided early in the new year immediately they have finished flowering. Each clump is carefully lifted, the soil removed, and the fleshy roots cut into a number of pieces, each with a crown, and replanted.

Proteas are excellent decorative plants and should be more widely grown in New Zealand. They are grey-leaved evergreens suitable for well-drained, sunny positions. They are extremely tolerant of drought. The flowers are conspicuous and attractive, though not really beautiful. At this time of year the gardener should observe some of the more popular protea species with a view to deciding which he could grow in his own garden.

Rambler roses such as Dorothy Perkins which have finished flowering before the end of January should also by this time have produced a number of vigorous new shoots from the base of each plant. Branches which have flowered should be cut out and the new shoots tied in to take their places.

Rock gardens should be overhauled at this time of year, all dead flower heads and pieces of straggly growth being removed. The full beauty of a rock garden cannot be appreciated if it is not kept tidy.

Rose blooms should be cut with long stems, as this encourages the growth of new shoots and prevents the bushes from becoming straggly. Faded flowers should be removed by cutting their stems back to the nearest bud or strong shoot rather than by simply removing the flower head itself.

Seeds of annuals for autumn planting may be sown in January. These include Brompton stock, winter-flowering pansy, stock Beauty of Nice, cinerarias, and wallflowers. At this time of year flower seeds are best sown in boxes or pots in a cool, shady place and left there until after germination; this method facilitates keeping the seed soil constantly moist.

[*Douglas Elliott photo.*
Proteas are decorative plants which succeed in most parts of New Zealand. The flowers are conspicuous and attractive. The one illustrated is *Protea neriifolia.*

Sweet peas should not be allowed to run wild after their original training in early summer. If dead flower heads are not removed regularly, flowering will soon cease.

Topdressing in the flower borders with ½oz. of sulphate of ammonia and ½oz. of superphosphate per square yard is very useful where particularly fine flowers are desired. This dressing should not be given if good dressings of flower-border fertilisers were given during spring.

Violas and pansies will have grown straggly by January and will be exhausted through continuous flowering. The plants should be cut back to within an inch or two of the ground to encourage them to send up new shoots, which probably will provide valuable flowers during autumn. A few plants may be left to provide cuttings which can later be rooted in the cold frame.

Pests and Diseases

Caterpillars of the magpie moth (woolly bears) will be attacking cineraria leaves in January. Looper caterpillars will be eating geraniums and other plants and leaf-roller caterpillars (above) will be common. They can all be controlled by hand picking and by dusting with derris or D.D.T. dust.

Geranium rust, which disfigures geranium plants by producing brown spots on the leaves, can be controlled by regular spraying with 2 fl. oz. of lime sulphur and ½ fl. oz. of colloidal sulphur to 2 gallons of water.

Greenflies will still be common and should be sprayed at 10-day intervals with nicotine sulphate at the rate of 1 fl. oz. to 4 gallons of water plus 6 fl. oz. of summer spraying oil until all trace of the pest has disappeared.

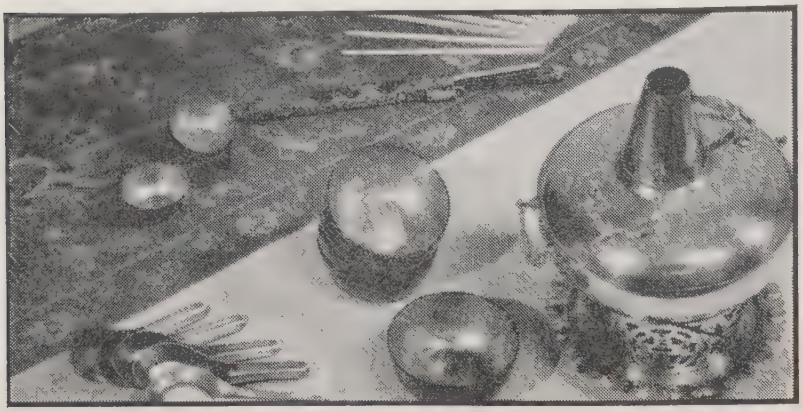
Narcissus fly: Cultivating the soil thoroughly where bulb foliage has died down will do much to reduce the possibility of attack from narcissus fly by making it difficult for the young larvae to find their way to the bulbs. When narcissus bulbs are lifted they should not be left lying about the garden, as this provides opportunity for the flies to lay their eggs directly on them. All bulbs that feel soft should be destroyed by burning, as they are probably infected.

Rose mildew is probably the commonest disease of roses in New Zealand. It attacks particularly severely where air does not circulate freely about the plants, for example, on rambler roses growing against a wall. This disease can be controlled reasonably well by regular dusting with flowers of sulphur. A convenient method of dusting is to place some flowers of sulphur in a small bag made of fine muslin and to hold this close to the plants and tap it sharply with a stick. This provides clouds of sulphur dust which reach most parts of the plant.

Subterranean grass caterpillar, larva of the large nocturnal porina moth, often ruins lawns by eating the grass and leaving large bare patches during summer. Poison baits have been found most effective in controlling this pest. Mixing thoroughly 2lb. of wheat bran with 2oz. of arsenate of lead powder, or with 1oz. of paris green moistened slightly, makes sufficient to broadcast over 1500 sq.ft. The application should be made on a fine, warm evening. Both arsenate of lead and paris green are extremely poisonous substances and the greatest care should be exercised in using them, especially where there are children or pets. The treatment can be repeated during February if the attack is serious. An alternative to the laying of baits is spraying with arsenate of lead at the rate of 3lb. of paste or 1½lb. of powder per 100 gallons of water.

Thrips are slender insects up to ¼in. long and varying in colour from yellow to black. Their attacks are particularly severe on gladiolus. Regular spraying with nicotine sulphate (1 part in 800) plus summer spraying oil (1 part in 100) will usually control this pest. D.D.T. dust is also effective.

An Informal Chinese Dinner Party



THE Chinese have a beautifully designed polished brass or copper equivalent of a chafing dish, illustrated above, for cooking food on the dining table. A lower section holds glowing charcoal or a small bowl in which spirit is burnt. Fitting into a rim is a bowl with a circular funnel in the middle open to the source of heat in the lower bowl. An extra brass cylinder is fitted to the funnel to extend it like a chimney. To shut off the source of heat the chimney can be removed and a flat lid put over the funnel.

For a party soup, noodles, and such food as cooked pork balls would be prepared. Separate dishes would contain raw food cut into small portions, including thin slices of beef, fish, prawns, chicken, bamboo shoots, bean curd, and green vegetables. The lovely metal contrivance would take the centre of the table, surrounded by the small dishes of raw and cooked foods. The individual covers for the guests would be laid with a pair of chopsticks, a china spoon, and perhaps three or four bowls. The largest china bowl would be used for rice or noodles, another for tea, and the smallest for wine. Chinese wine bowls are very small—sometimes smaller than an eggcup—and they need to be, for rice wine, and still more bygar, which is a rye distillation, are very potent. Some of the lovely stone wine bowls with stems which come from north-west China are white, some pale jade green veined with white, and others dark grey, almost black, veined with white.

With his chopsticks each guest would pick up pieces of food from the dishes in the combination that he desired and drop them into the centre bowl filled with soup simmering over the heat. They would cook in a minute or two, when he would remove them on to his bowl of noodles, with which he would enjoy them. The process would continue amid sparkling conversation until the dishes were empty or appetites satisfied. Then the delicious soup would be removed to the bowls with the spoon and consumed last. Tea would probably be served and melon seeds chewed while the dishes were brought to the table.

The host always sits with his back to the door, and he will help his guests to food, especially to any titbits. Courtesy and politeness are an integral part of the occasion.

—DOROTHY JOHNSON,
formerly Rural Sociologist,
Department of Agriculture,
Christchurch

Morsels of prepared food from the dishes in the foreground are dropped into the simmering soup in the chafing dish.

Death of Mrs. E. E. A. Topping

MRS. E. E. A. TOPPING, Rural Sociologist in the Auckland office of the Department of Agriculture, whose death occurred in Auckland recently, was well known to "Journal" readers and country women. As a regular contributor to the women's section of the "Journal" up to the time of her illness Mrs. Topping made her name familiar to thousands of women throughout New Zealand. In all spheres of her Departmental work she had as her aim the betterment of rural living and the easing of the task of the farm housewife. She recognised the importance of the farm home as an integral part of farming and strove to help country women in improving home planning and management.

The articles written by Mrs. Topping for the "Journal" in the last 6 years have dealt with a wide variety of subjects and were designed to guide women in home crafts and housekeeping. Her recommendations and advice revealed a keen appreciation of country women's problems and difficulties, an understanding developed as the result of her own experience of farming life in both the North Island and the South Island.

Born in England, Mrs. Topping came to New Zealand with her husband about 1924 and lived on farms in Southland, Waikato, and the Bay of Islands. In 1943 she was appointed Supervising Matron of the Services Vegetable Project, with headquarters in Auckland, and was responsible for the living and working conditions and the recruitment and welfare of 500 to 600 women in 13 areas.

In 1945, when the Department of Agriculture established positions for women extension workers in domestic science, Mrs. Topping was the first to be appointed as a Field Officer in Rural Sociology. She gave lectures in different parts of the Dominion, but was best known in the Auckland Province.

Among the wide circle of acquaintances Mrs. Topping established through her "Journal" articles, her attendance at women's meetings, farm schools, and demonstrations, and through her extensive correspondence she will be remembered for her deep understanding, her generosity, and her willingness always to help.

BOOK REVIEW

"Me and Gus": F. S. Anthony and F. Jackson

The robust humour of this book and the true New Zealand flavour it derives from its colloquial style should appeal to country people and townsfolk alike. It will be of special interest to the many listeners to the radio feature of the same name which has been broadcast by the National Broadcasting Service.

Adapted and revised by Francis Jackson from an earlier publication and unpublished notes by Frank S. Anthony, "Me and Gus" is the droll story of the impetuous schemes and ventures of two of Taranaki's less prosperous dairy farmers. The book's entertainment value is considerably enhanced by 16 amusing line drawings by Nevile Lodge.

A. H. and A. W. Reed. 8s. 6d.

Flies are Filthy and a Menace to Health

FLIES, as well as being disgusting and disagreeable pests because of their filthy habits, are among the most efficient carriers of germs of dangerous diseases and therefore one of the greatest enemies of man. They are born in, reared in, and associated with dirt throughout their lives. From garbage, manure, and dirt of all kinds, flies come straight into homes and on to food. Effective control of flies depends on general cleanliness in the home and out of it, as well as on destroying the pests whenever possible. Those that cannot be destroyed must be prevented from settling on food. Measures which will help to combat flies are suggested in this article by Anna M. Chapman, formerly Rural Sociologist, Department of Agriculture, Dunedin.

SEVERAL species of fly may invade houses, particularly during summer, by far the commonest being the ordinary housefly. Others are the blowflies, or bluebottles and greenbottles, which tend to come indoors for shelter as soon as the weather becomes cold and therefore are seen more in autumn; these are notorious for laying their eggs on decaying animal matter or unprotected meat. The biting housefly or stable fly resembles the ordinary housefly, but is larger and has mouth parts which enable it to pierce the skin and suck blood; it is mainly a pest of stock, but will come inside for shelter and then may bite human beings, especially round the ankles.

Diseases known to be spread by flies include typhoid fever, dysentery, summer diarrhoea, and cholera, and flies carry the eggs of parasitic worms. They may feed on refuse or dung and then settle on human food, transferring to it dirt and very probably disease germs. As most of the foods on which they alight are not cooked before being eaten, the germs are not likely to be killed, and even cooking does not remove dirt which the flies may have left.

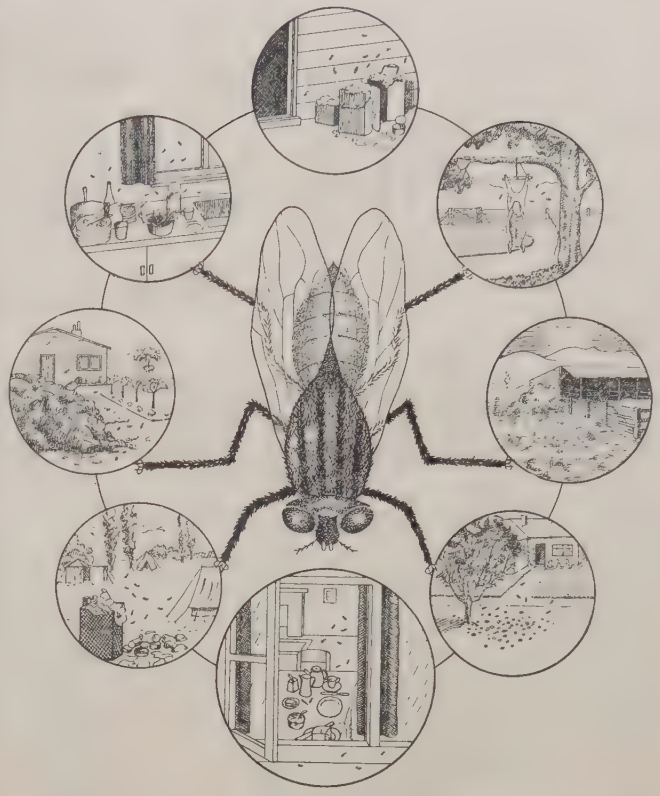
A fly can take in only liquid food. When one is seen apparently feeding on a solid substance such as sugar, in fact it is first dissolving the sugar by depositing some of the liquid contents of its stomach on to it, and then sucking up the sugar solution which has thus been formed. If a fly is observed closely while it is feeding, it may be seen to vomit small, round drops of nearly clear liquid on to its food and then suck most of these up again. Many so-called fly-marks consist of these drops of vomit, and not of excreta as is commonly thought.

Flies deposit vomit or excreta on everything on which they alight. Disease germs may survive in the stomach of the insect for at least 6 days after it has fed on infected material, and these germs can be redeposited in the fly's vomit or excreta on anything on which it may alight. Flies can thus infect food for several days after eating infected matter.

As well as carrying germs in their intestines, flies may also carry them on the hairs of their bodies and legs, and these germs may survive for several hours. Flies have sticky pads and "claws" on their feet which pick up germs readily and can then infect the surface of food on which they walk. Typhoid fever germs can be active for 2 days or longer after the fly has been contaminated.

The part played by flies in carrying typhoid fever germs from person to person was established first during the Spanish-American and South African Wars. Flies coming straight from the latrines with their legs, wings, mouths, and bodies soiled with typhoid germs would enter the tents of soldiers and settle on their food supplies and drown in their stores of milk. It was realised at last that flies were thus spreading the disease into epidemic form. When fly larvae (maggots) are reared in excreta infected with typhoid fever the flies developing from them contain typhoid germs in their intestines, and these germs can then be deposited on food in their excreta and vomit.

Undoubtedly flies spread dysentery and all other intestinal diseases, such as summer sickness, all forms of diarrhoea and some other "food-poisoning" infections, in the same way as they spread typhoid fever. It has also been shown recently that the poliomyelitis virus can be isolated from flies caught in the neighbourhood of poliomyelitis cases. They can pass on certain skin infections if they alight on a sore place and so pick up the germs. Perhaps even more dangerous is the fact that flies can transmit the germs of tuberculosis by feeding on the sputum of patients and then depositing the germs on food in their vomit and excreta.



Because flies carry dirt as well as disease germs, even in country districts where few disease germs may lurk it is still necessary to take all possible precautions against flies.

Life Cycle of a Fly

The fact that one fly may carry up to 4 million germs on its body and up to another 28 million in its intestines points the importance of protecting food from them and killing as many as possible of these enemies of man. Some knowledge of the fly's life cycle is necessary before the best methods of destroying the pest can be worked out.

The female housefly lays its eggs in large numbers in any refuse that will provide food for the maggots. Each female may lay up to 150 eggs at a time and she may lay half a dozen such batches during her life of 1 or 2 months. In warm weather the eggs may hatch in 8 to 24 hours, but hatching may take 3 days in colder weather.

The freshly hatched maggots are very small and they burrow into their food, feeding greedily and growing fast. They may be present in large numbers in the surface layers of manure heaps and refuse dumps. Fermentation often causes the inside of the pile to be too hot for them to live there—an important factor in checking the breeding of flies in compost heaps.

After about 2 days, when the maggots are fully grown and about ½in. long, they leave their original home in search of a cooler, drier place in which to live while they change into flies. They frequently burrow into the soil and hatch out there, which makes them difficult to destroy at this stage. The pupa or chrysalis hatches into an adult fly in 3 to 4 days in warm, sunny weather. The newly emerged housefly looks shrivelled and lacks colour, but gradually the wings spread out and the outer body hardens, and it can fly away in about an hour. Flies do not grow at all after hatching from the chrysalis, so the commonly held belief that small flies are houseflies which are not fully grown is not true; they are of a different species, sometimes known as the latrine fly.

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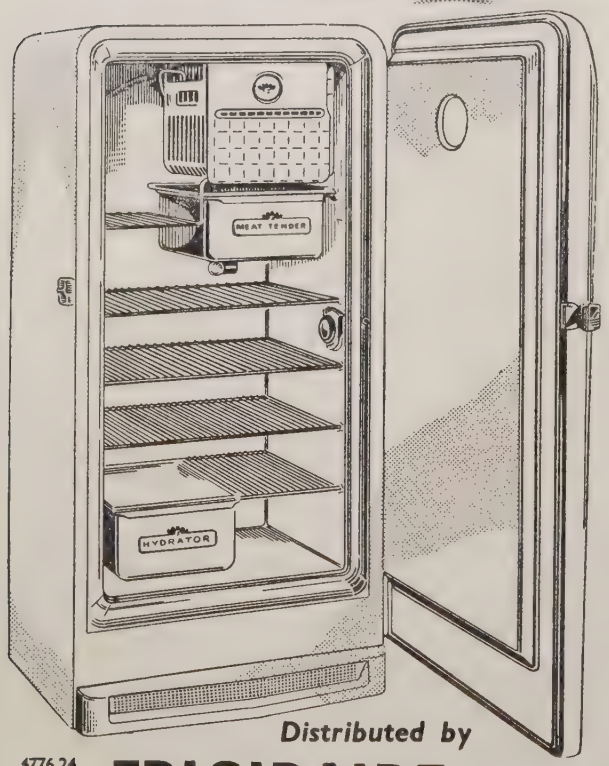

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When a female fly is about a week old it will mate and a few days later will begin laying eggs. The whole life cycle usually takes about a fortnight in warm weather, and can take as little as a week. If all the progeny of a single fly lived and reproduced for successive generations throughout the summer, an overwhelming calculation would be needed to establish for how many millions the one fly could be responsible in the 3 or 4 months during which flies usually breed.

In New Zealand flies usually appear in increasing numbers in October, but the greatest numbers are seen in the summer months of December, January, and February, as they are breeding most rapidly then. Breeding almost ceases in March, by when the annual summer invasion of flies is over, and they are not seen except for a few in heated premises. The insect normally survives the winter by hibernating, by remaining in the pupal stage, or by continuing to breed in a few warm, favourable places.

Preventing Breeding of Flies

Flies can be killed at every stage in their life cycle except at that of the chrysalis; that is, they are vulnerable as eggs, maggots, or adult flies. Because of the rapidity with which flies breed, preventing their breeding is a far more effective way of dealing with the problem than allowing them to breed and then having to kill the adult flies.

Flies will breed not only in dung from animals or man, in food and putrefying meat, or in fermenting vegetable matter or offal, but also in rotten straw, in rotten wool or cotton garments, and in decaying fruit or grain. A favourite breeding place of the housefly is in lawn clippings which have been heaped up and allowed to ferment. Therefore to leave dirt or refuse of any kind lying about within or outside the house is to provide first-class breeding places for flies. Absolute cleanliness is the only way to avoid this, and refuse must be disposed of in such a way that it is either inaccessible to flies or made unsuitable as a breeding ground. Following are some measures which assist in the control of breeding grounds.

Garbage should be kept in tins with well-fitting lids. The tins should be cleaned frequently, inside and out, and rinsed with a disinfectant.

Manure should not be left in a heap for a long period, but should be spread on the fields as frequently as possible so that it can dry out. This kills any maggots developing in it. If labour is not available to cart the manure out frequently, the pile should be dusted or sprayed with D.D.T. every few days. Likewise, lawn clippings should not be left in heaps, but should be spread and well dried before being disposed of.

Preventing flies from settling on compost and similar refuse heaps is not practicable, but the high temperatures reached in a properly constructed heap are sufficient to kill eggs and larvae. However, many of the flies are killed when they settle if the heap is kept sprinkled with an efficient insecticidal powder. Should the heap become fly blown, the eggs and maggots may still be killed, because the centre of the pile, as a result of fermentation of the refuse, is too hot for them to live there. Therefore the eggs are laid and the maggots hatch very close to the surface of the pile, and if the outer 6in. of the pile is turned into the centre every second or third day during summer, the eggs and maggots are destroyed.

Offal from animals killed for consumption, as well as animals and poultry that have died from natural causes, should be buried or burnt before flies have the opportunity to lay eggs on them. If fly-blown material is buried, flies will emerge from it, so eggs must be destroyed before such material is buried.

Earth closets should be made as fly proof as possible, and a good insecticide or kerosene should be added to the pan frequently to kill flies or maggots that may get in.

Food supplies should always be kept well screened and away from flies, not only to avoid contamination of the food, but also to prevent flies from laying eggs on them.

Refuse dumps at camping grounds should be properly attended to if they are not to become infested with maggots. Throwing out tins with the dregs of food still in them is inviting trouble, and these and all food refuse should be buried or burnt. A good method is to dig a pit for scraps, and every time more refuse is thrown into it sprinkle sufficient soil back in the pit to cover all the garbage completely. If tins are burnt out or washed thoroughly so that no food scraps remain in them, they may be dumped separately, as they will fill up a refuse pit very quickly. The important factor is that no food or refuse should be left where flies can reach it.

Destruction of Adult Flies

Killing flies in the chrysalis stage is almost impossible. When they are ready to change, the maggots burrow down into the soil, where it is extremely difficult to reach the chrysalis, especially as the maggots may burrow many feet down in light and open soil.

Careful storage of all food to prevent flies settling on it is of the utmost importance in preventing contamination by adult flies. Perishable foods should be stored in well-ventilated, fly-proof safes, and all other foods should be kept in fly-proof cupboards or be carefully protected from flies. Screen doors and windows could be used far more commonly than they are in New Zealand to prevent the entry of flies, especially into dining rooms, kitchens, and store rooms. A variety of traps, sticky papers, poisons, and swatters is available, all of which can be used to catch and kill flies that gain access to the house.

However, the most important measure in destroying adult flies is the use of an efficient insecticide. This can be painted, sprayed, or dusted on to windows, window sills, ceilings, walls, doors, storage cupboards, electric light bulbs and cords, and any other place inside or outside the house on which flies are in the habit of alighting.

Types of Insecticides

The most widely used and efficient insecticide for the control of houseflies is D.D.T. Others still used frequently are pyrethrum and derris dust, and benzene hexachloride dust has become available quite recently.

D.D.T. was first used in any quantity in 1942, when supplies of pyrethrum and derris from natural sources had been stopped by the Japanese advance. Experiments with D.D.T. were carried out and, as they were extremely successful, large-quantity production was begun.

D.D.T. in its crude state is a white powder, which is insoluble in water but soluble in oils and other organic solvents; for example, kerosene and carbon tetrachloride.

It is a contact poison; that is, the fly need only touch it for it to take effect. It is absorbed into the body and causes gradual paralysis, which is followed by death. Because the effect is not immediate, the fly may alight on and contaminate foods after it has come in contact with D.D.T. and before it is completely paralysed.

Pyrethrum has a much quicker paralysing effect, and after coming in contact with it the fly will succumb at once, and thus is not likely to contaminate food unless it falls into it. Pyrethrum has not the lasting quality of D.D.T. and must be used much more frequently. D.D.T. need be used in a room only every 4 to 6 months to retain its effectiveness.

Sometimes D.D.T. and pyrethrum are used together in spray insecticides. The pyrethrum will knock the flies down at once and the D.D.T. will kill even those which have been only stunned by the pyrethrum and which might have recovered from its effects.

For normal household purposes D.D.T. or D.D.T. and pyrethrum is much the best insecticide to use against adult flies.

If the following precautions are observed, danger from the use of D.D.T. will be eliminated and the insecticide will prove of the utmost value to householders:—

The insecticide, especially when in solution form, should be labelled "Poison" and should be applied only by a responsible person.

When not in use it should be locked up in a cupboard away from food and children.

The solution should be painted on to places where flies rest frequently; for example, walls, window frames and sashes, ledges, light shades, bulbs, and cords, and picture frames and rails.

The solution should not be applied where food may come in contact with it or where children are likely to get it on their hands.

After handling D.D.T. the hands should be washed in warm, soapy water.

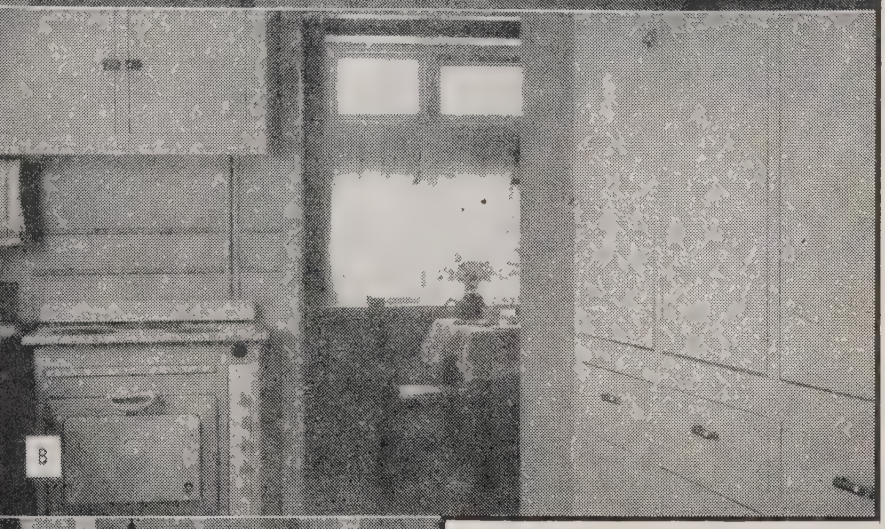
However, to destroy only adult flies is not sufficient. The breeding grounds and the maggots must be attacked as well, for to prevent flies breeding in large numbers is obviously the only way to decrease the menace.

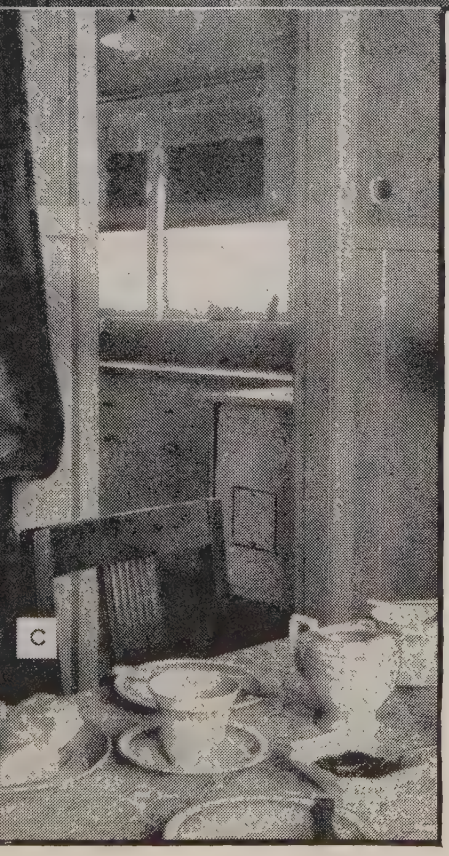
Renovation of Farm Kitchen

By EIRENE E. UNWIN, Rural Sociologist, Department of Agriculture, Christchurch

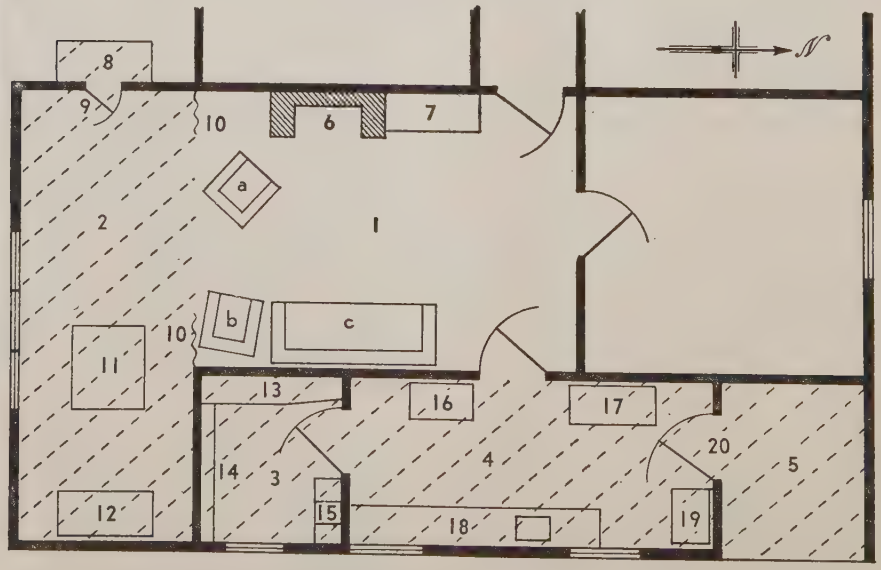
A LONG narrow lean-to kitchen at the back of a squarish 4- or 6-roomed house is fairly common, but it may present a variety of problems to the would-be renovator. The following description of how such a kitchen was converted and brought up to date may prove useful to any who are contemplating renovation, especially if their house is of the style typical of 20 to 40 years ago. They may not all be able to solve the problem in exactly the same way, but the solution found here produced a new kitchen following so closely the approved principles of kitchen planning that all should be able to learn something useful from it.

IT was a farm kitchen where quite often meals for a number of men, as well as for a family of 3 children, had to be prepared. With no help the housewife found an inconvenient kitchen a severe handicap. Originally the house had been approximately square, the sort with a central passage and rooms opening on either side. The original kitchen was a back room,





A—Sink bench between refrigerator and range with store cupboard above. Notice especially swing tap, pull-out chopping board, and drawers for kitchen cutlery over bins. B—New door to dining alcove, with china cupboard and drawers for silver, etc., on right. C—View across dining table to kitchen. The curtain between dining and living area is at left. Below—Plan before kitchen was renovated. (Shaded area shows addition to original house.) 1—Living room (a, b, and c is an upholstered suite). 2—Dining alcove. 3—Pantry. 4—Kitchen. 5—Back porch. 6—Open fireplace. 7—Sideboard (cupboard built in). 8—Wood box (opens outside). 9—Inside door to 8. 10—Curtains (to dining alcove). 11—Expanding dining table. 12—Desk. 13—China cupboard and stores. 14—Open store shelves. 15—Bins. 16—Refrigerator. 17—Men's dining table. 18—Sink bench with pot cupboard beneath. 19—Range. 20—Back door.

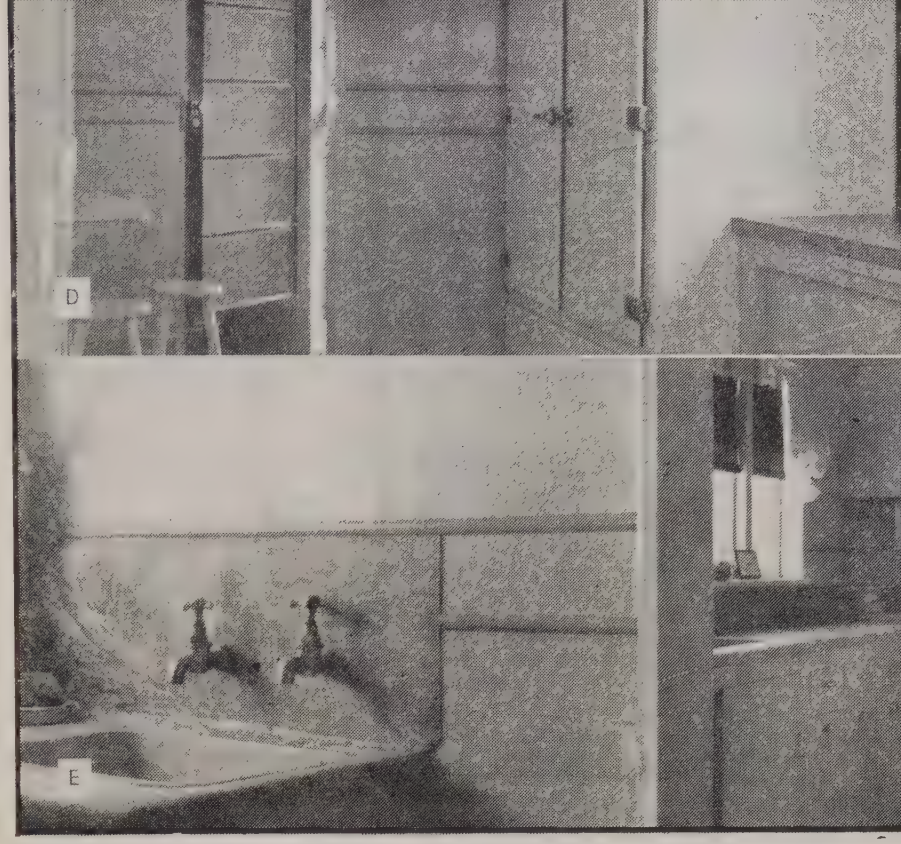


with one room leading off it to the left, a door to the passage, a back door opposite, and with windows on the south wall. At some time this room had been enlarged along the south and east walls and converted into an L-shaped dining-living-room and a new lean-to kitchenette added at the back, in the angle of the L (see plan on opposite page). The dining end was an addition which occurs less commonly than the lean-to kitchen and it made further and very satisfactory renovation of the two rooms comparatively easy. But the plan below shows how houses where the dining wing does not exist can be modified to produce a kitchen design similar to that achieved by the renovation.

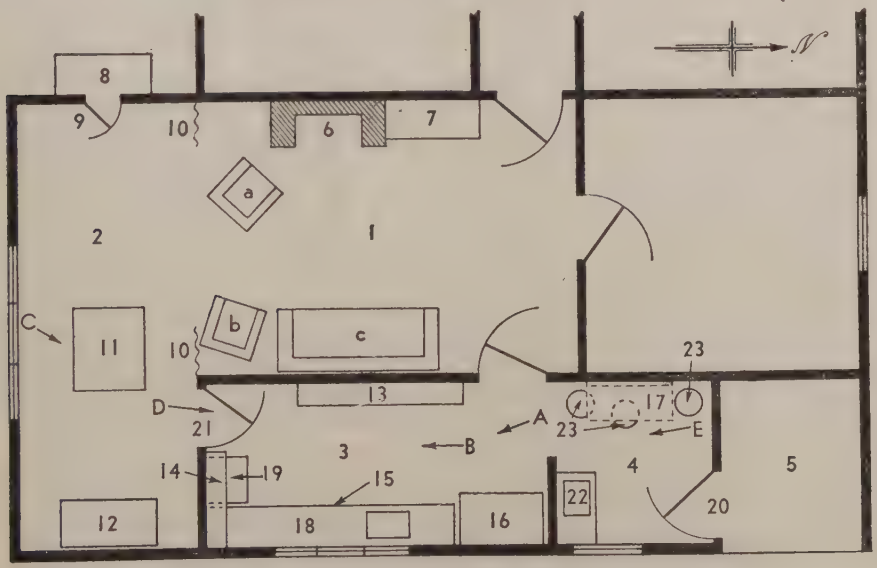
Faults in Original Layout

It was almost impossible for the equipment in the kitchenette in the plan on the opposite page to be arranged conveniently, because of the position of the doors and the built-in fixtures. Here is a list of some of the faults. The reader, like the housewife who had to cope with them, would probably discover more:—

1. A great deal of walking is necessary between preparation bench, storage cupboards, and bins, stove, and dining table, between back door and storage cupboards and refrigerator, and between china cupboard, dining table, and sink. In other words the major pieces of equipment in their relation to each other and to the doors and the dining table were not arranged according to the natural sequence of the work, assembly line fashion.



D—Men's dining alcove with drop table and stools; the new door to the back porch is beyond the partition. E—Men's washing corner behind the partition with kitchen beyond. Below—Plan after kitchen was renovated. 1—Living room (a, b, and c is an upholstered suite). 2—Dining alcove. 3—Kitchenette. 4—Men's dining and washing alcove. 5—Back porch. 6—Open fireplace. 7—Sideboard (cupboard built in). 8—Wood box (opens outside). 9—Inside door to 8. 10—Curtains (to dining alcove). 11—Expanding dining table. 12—Desk. 13—New china and store cupboard; also drawers for silver, dusters, table cloths and tea towels. 14—Store cupboard above range. 15—New bins built in under bench. 16—New, larger refrigerator. 17—Men's dining table (drop-down). 18—New sink bench, with cupboard and bins beneath. 19—Range. 20—Back door (new position and glassed). 21—New door to dining alcove. 22—Old sink (for men's and children's hand washing). 23—Stools. A, B, C, D, and E are the positions from which the photographs identified by these letters were taken.



2. The storage space in the pantry is awkward to get at and the door opens back against the bins, so that one has to go round it to reach them.
3. The back door opens against the range, too close for the convenience of the housewife. Traffic from the back door round the table to the living room crosses the path of the housewife to and from the range. The table, too, is always in the way of anyone going or coming through the back door, especially in the dark.
4. There is nowhere for the men coming in for meals to wash except at the sink, which is very awkward for the housewife in the middle of the last-minute details of meal preparation. Then when the men sit down at the table they are in full view of anyone at the back door, and of course in the way of anyone coming in or going out, and still in the way of the housewife working at the range.

Though the list of faults is not long, the various difficulties represent a great handicap to the housewife in the smooth management of her kitchen.

The New Plan

The L-shaped living-room made it possible to produce a very neat layout in the renovated kitchen and to do away with all the handicaps listed (see plan on this page).

The pantry wall was removed and a door cut through the back of the old pantry, giving direct access to the dining alcove. The equipment was rearranged, so that the sequence from the back door to the dining table became all that could be desired. Food

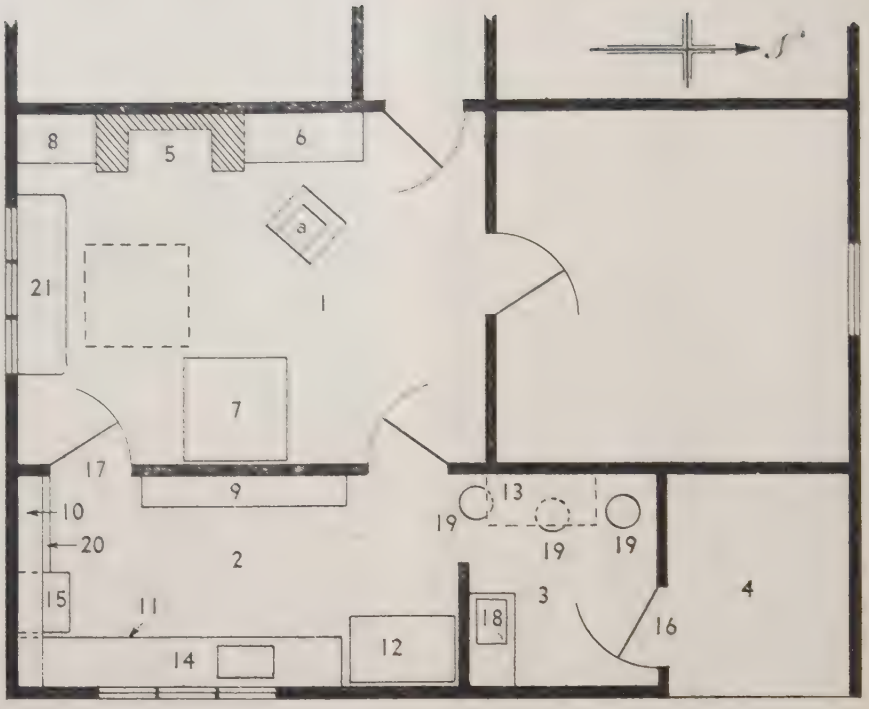
delivered at the back door is stored in the refrigerator and in a grocery cupboard above the range and is then convenient to the preparation bench on either side of the sink. All the equipment for meal preparation is stored in the drawers and cupboards below the bench. The prepared food is taken direct to the stove, with a minimum of further steps, and when cooked and dished at the stove or at the end of the bench beside it carried just through the new door to the dining table. Clearing away is equally direct, dishes being carried from the family or the men's dining table straight to the sink; when dried they are merely taken across the narrow room to the china cupboard and silver drawers. The only time many steps are needed is from the stove to the men's dining table, but even this distance is less than formerly from the range to the main dining table.

The back door was shifted, freeing the corner between the back door and the door to the living room for a table (let-down) and several stools, where men could sit and dine in comfort and out of the line of traffic. Because of the extra length provided by removing the pantry wall, there was space for a partial wall between the refrigerator and the back door, and a wash basin (the old sink), mirror, and towel were placed in the corner created. Thus men and children coming in from outside could wash in reasonable privacy and the housewife could complete the preparation and serving of the meal unhindered. To increase the light in this corner the back door was glassed in to within 1ft. of the floor.

Traffic Avoids Work Area

Traffic from the back door to the living room now avoids the work area completely, yet the refrigerator has been brought to within only a few steps from the back door, which is most convenient.

Along the wall opposite the sink, originally taken up by the large refrigerator and broken into by the pantry wall, a new china and general storage cupboard and silver drawers were built. The cupboard was made shallow, as it is much more convenient to store pieces of china one or, at most, two deep on shelves than to have frequently to reach past things in front to reach things behind. As this cupboard is close to both sink and dining table, it is convenient both when washing up and laying the table.

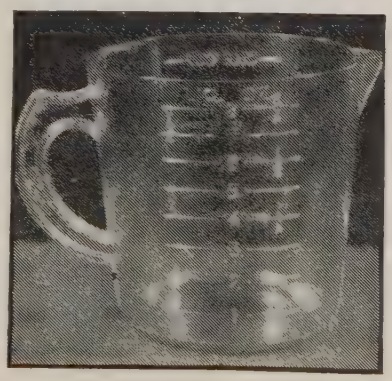


Alternative plan (no dining alcove). 1—Living room. 2—Kitchenette. 3—Men's dining and washing alcove. 4—Back porch. 5—Open fireplace. 6—Sideboard (cupboard built in). 7—Expanding dining table (dotted line shows alternative position for meals in winter). 8—Small built-in desk. 9—China and store cupboard; also drawers for silver, dusters, table cloths, and tea towels. 10—Store cupboard above range (full width of room). 11—Bins built in under bench. 12—Refrigerator. 13—Men's dining table (drop-down). 14—Sink bench with pot cupboard beneath. 15—Range. 16—Glassed back door. 17—Door to dining end of living room. 18—Old sink (for men's and children's hand washing). 19—Stools. 20—Serving table with cupboard beneath. 21—Window seat.

Although the original storage cupboard and small table could have been used again as they were and the bins merely shifted and built in under the sink bench when this was moved to the right, it was thought worth while instead to have new cupboards and bins built to make the most of the available space. Similarly the table was exchanged for one that was hinged on to the wall so that it could be dropped down when not in use. The windows, too, could have been left where they were, but their position was altered; they were widened and the sills were raised, making a much more attractive and better lighted kitchen. A new cemented rubber-linoleum surface was used on the bench top and the "new" kitchen was painted throughout in cream enamel picked out with green to match the enamel of the range. The green was used on a beading round the walls and on the inside of the cupboards. The result was much prettier and brighter than the original rather dull blue; the green was not overdone, but was used to provide interest in an unusual manner.

The only drawback which the housewife now finds is that the children use the china cupboard wall as a centre round which to play chasing games—in by the old door from living room to kitchen and out by the new one from kitchen to dining alcove.

Transparent Plastic Measuring Cup



MEASURING CUPS of transparent plastic are now available in New Zealand shops. One side is graduated in ounces and the other in quarters and thirds of a standard 8oz. cup. These cups do not break easily and can safely be used for measuring hot liquids, though it is not wise to leave them soaking in hot water for long periods. One cup of sugar weighs 8oz., a cup of sifted flour weighs 4oz., and a cupful of liquid is two-fifths of an imperial pint. A cup contains 16 level measuring tablespoons of dry ingredients. If measuring cups are kept permanently with the kitchen supplies of staple dry foods, these ingredients can be measured directly into the cooking bowl or saucepan.

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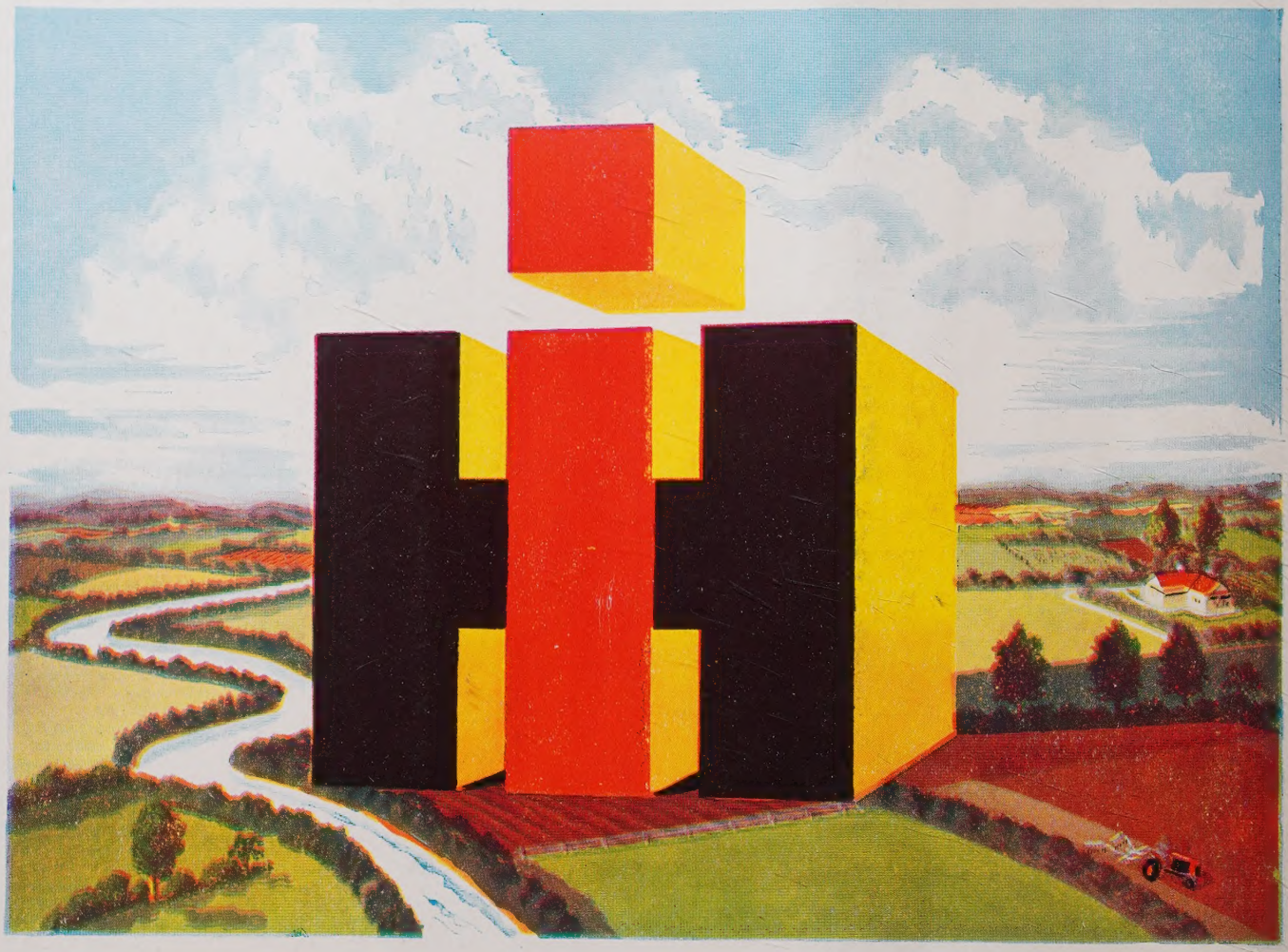

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